LEAVING NO ONE BEHIND

GUIDEBOOK

L N O B

Co-funded by
the European Union

FOREWORD

The significance of sports transcends the boundaries of physical activity. It fosters camaraderie, builds resilience, and promotes a healthy lifestyle. As we launch this guidebook, we take pride in contributing to a more inclusive, supportive, and empowering sporting environment for women and girls, especially those passionate about football. This guidebook is not just a resource but a testament to our collective dedication to fostering physical and mental well-being through structured, evidence-based practices.

Through this project, we have brought together the expertise and passion of three distinguished organizations across two European countries - Slovakia and Serbia. At its core, the collaboration represents the unity and innovation of the Erasmus+ Sport Programme, championing values of inclusion, diversity, and excellence. Our shared vision was to empower girls and women by providing them with the tools, knowledge, and confidence to perform and thrive in their sporting endeavors.

The creation of this guidebook was made possible by the outstanding contributions of our consortium members. The modern and inclusive approach of Bratislavia (Slovakia), the academic rigor and research excellence of Comenius University in Bratislava, Faculty of Management (Slovakia), and the unparalleled expertise in sports science of Trenažna Ekspertiza (Serbia) have been pivotal in delivering this comprehensive resource. Notably, the leadership of Prof. dr. Marko Stojanović from Trenažna Ekspertiza, who spearheaded the guidebook's development, has ensured that every recommendation within these pages is grounded in science and tailored for real-world application.

This guidebook is divided into carefully designed modules, covering essential aspects such as warm-up, injury prevention, cool-down strategies, and their broader impacts on physical and mental health. Each section is enriched with practical tips, video demonstrations, and actionable insights, making it a valuable tool for coaches, athletes, and sports enthusiasts.

We hope this guidebook inspires its readers to embrace the principles of a healthy lifestyle, prioritize injury prevention, and understand the immense value of preparation and recovery in sports. By adopting these practices, we believe everyone - from grassroots players to professional athletes - can unlock their full potential and enjoy the numerous benefits of sports, both on and off the field.

On behalf of the entire consortium, we extend our gratitude to all those who have supported this initiative. We are especially grateful to the European Union for its invaluable co-funding, without which this project would not have been possible. Together, we aim to set a precedent for sustainable, inclusive, and impactful sports projects that empower individuals and strengthen communities.

Let this guidebook be a step toward a healthier, more vibrant sporting future for everyone - Leaving no one behind.

Leaving no one behind

TABLE OF CONTENTS

TRENAŽNA EKSPERTIZA

VIDEO CONTENT

To bridge the gap between theory and practice, we have included a comprehensive video demonstration of the warm-up procedure detailed in this guidebook. This video provides step-by-step instructions to help athletes, coaches, and sports enthusiasts implement a scientifically backed, structured warm-up routine before engaging in any sport activity, particularly football (soccer).

The warm-up procedure is divided into six key areas, each designed to prepare the body for optimal performance while minimizing the risk of injury.

How to access the video?

To see the full warm-up procedure in action, watch the instructional video here:

Click on the link: Warm-Up Procedure Video
or type in your browser: https://youtu.be/PqheYPWH-xM
or contact us at info@bratislavia.com

This video complements the guidebook by demonstrating each segment of the warm-up, ensuring correct execution and providing visual guidance for coaches and athletes alike. By incorporating this routine into your preparation, you can optimize your performance and minimize the risk of injuries.

INTRODUCTION

Football is more than a sport - it is a universal language that unites people across cultures, ages, and backgrounds. This guidebook was born out of a shared vision to harness the power of football to promote physical well-being, mental resilience, and a sense of community among girls and women. Grounded in the principles of inclusion, diversity, and excellence, this resource serves as a practical and educational tool for athletes, coaches, and sports enthusiasts to enhance their approach to preparation, performance, and recovery.

ABOUT PROJECT

This guidebook is a direct outcome of an Erasmus+ Sport Programme initiative, a groundbreaking collaboration between three organizations across Slovakia and Serbia. The project brought together a consortium of experts to deliver innovative methodologies, combining modern practices with long-standing expertise in sports development.

- Bratislavia (Slovakia) contributed their holistic and inclusive approach to sports organization, ensuring equal opportunities for athletes of all backgrounds.
- Comenius University in Bratislava, Faculty of Management (Slovakia) brought academic excellence, providing research-driven insights.
- Trenažna Ekspertiza (Serbia), led by the esteemed Prof. dr. Marko Stojanović, provided the scientific foundation and practical know-how for this guidebook, leveraging their regional leadership in sports science and kinesiological treatments.

Through a series of football (soccer) matches and workshops, the project emphasized the physical and mental well-being of female participants, addressing vital issues such as healthy lifestyles, injury prevention, and personal development.

TRENAŽNA EKSPERTIZA

PURPOSE OF THE GUIDEBOOK

The guidebook addresses a critical aspect of sports performance and participation - the importance of proper training, injury prevention, and recovery.

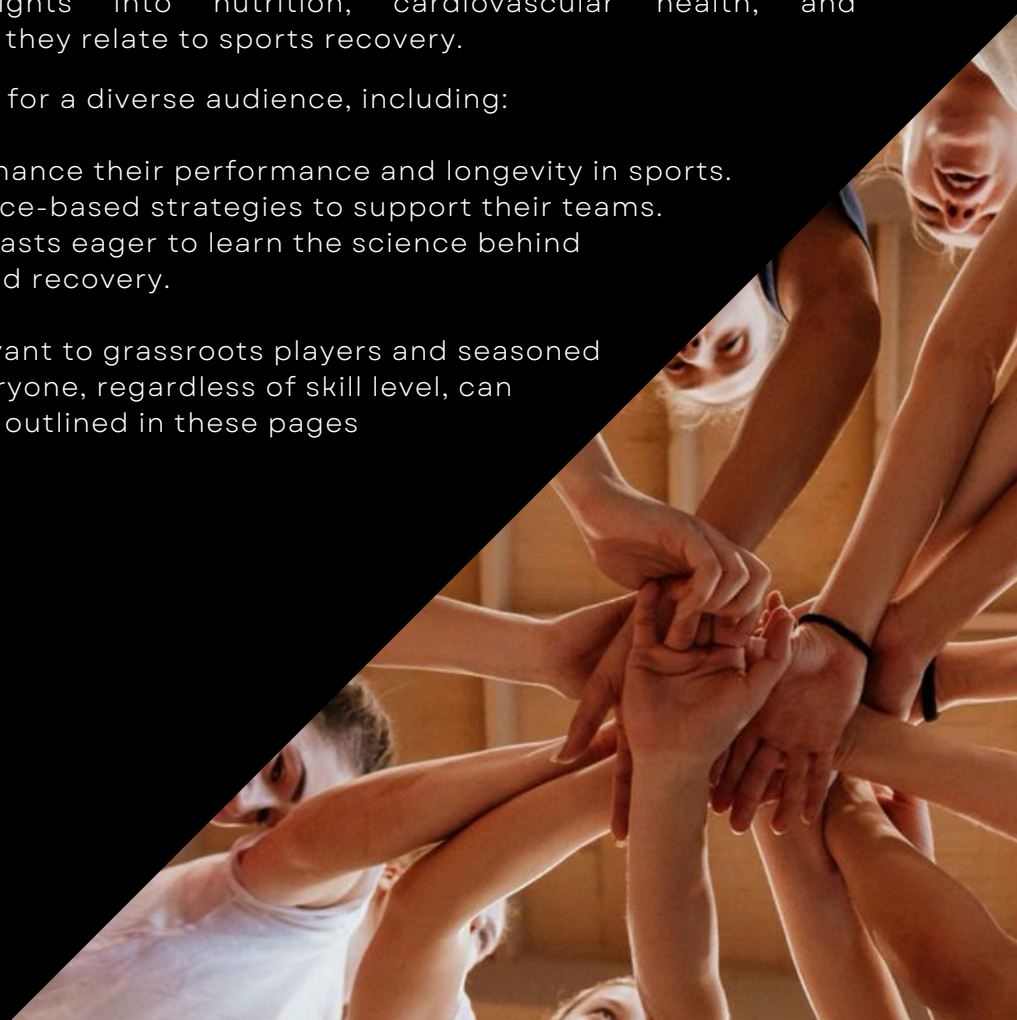
In football, as in any physical activity, success depends not only on skill but also on preparation and care for one's body and mind. This resource aims to:

- Provide a comprehensive framework for effective warm-up and cool-down practices tailored to football.
- Educate readers on injury prevention strategies that are scientifically backed and practically tested.
- Highlight the physical, mental, and social benefits of structured exercise routines.
- Offer actionable insights into nutrition, cardiovascular health, and musculoskeletal care as they relate to sports recovery.

This guidebook is designed for a diverse audience, including:

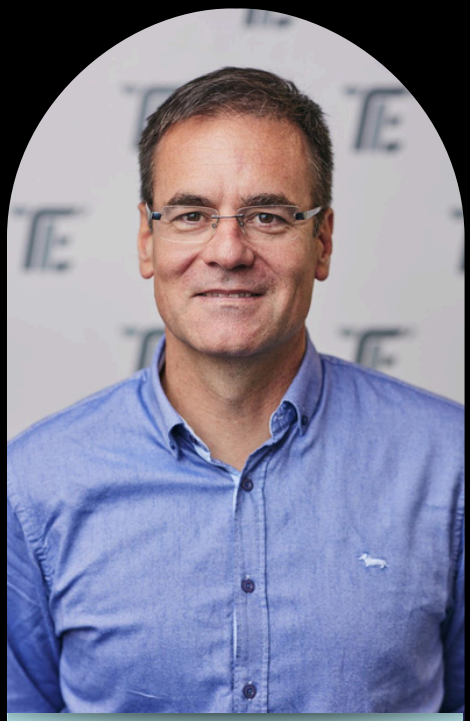
- Athletes who wish to enhance their performance and longevity in sports.
- Coaches seeking evidence-based strategies to support their teams.
- Sports staff and enthusiasts eager to learn the science behind effective preparation and recovery.

The content is equally relevant to grassroots players and seasoned athletes, ensuring that everyone, regardless of skill level, can benefit from the principles outlined in these pages



Leaving no one behind

A NOTE FROM THE PROFESSOR



Prof. dr. Marko Stojanović

Dear Readers,

It is with great pride and enthusiasm that we share this guidebook with you - a resource born from collaboration, innovation, and a shared commitment to empowering athletes. As someone deeply involved in sports science and education, I have witnessed firsthand the transformative impact that proper preparation and recovery can have on an athlete's performance, health, and overall well-being.

This guidebook is not merely a set of instructions - it is a bridge between research and practice, carefully designed to address the unique needs of football players at all levels. Whether you are an aspiring athlete, a seasoned coach, or simply someone passionate about sports, the knowledge and methods presented here will provide you with practical tools to elevate your approach to training, injury prevention, and recovery.

Our work throughout this project has focused on blending the latest scientific insights with hands-on experience. Each module reflects evidence-based practices, tested and refined through our daily interactions with athletes. From the modern evolution of warm-up techniques to the holistic benefits of cool-down routines, this guidebook encapsulates years of expertise and dedication to advancing health and performance in sports.

Remember, preparation is not just the start of a game - it is the foundation for success. Recovery, on the other hand, is not the end - it is the beginning of growth. Together, they form a cycle that ensures not only optimal performance but also longevity in your sporting journey.

I invite you to explore these pages with curiosity and an open mind. Let this guidebook be a companion on your path to achieving your goals, both on and off the field.

Wishing you success, health, and an enduring love for the game,

Prof. dr. Marko Stojanović

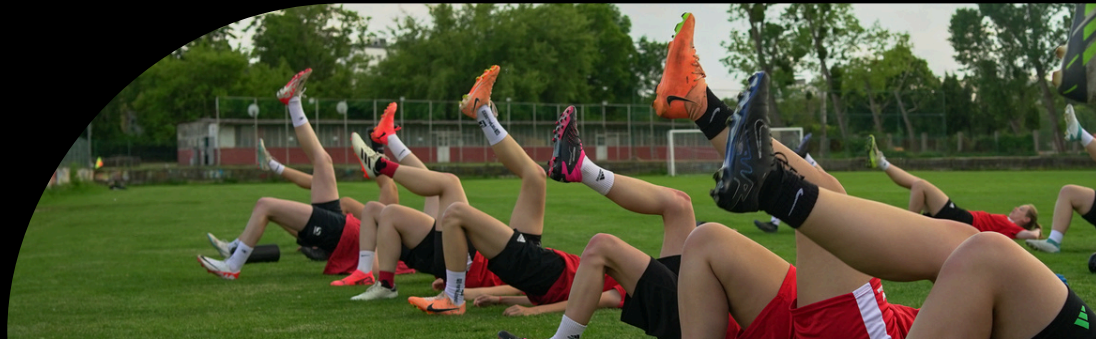
M1

WARM UP - AN UPDATE

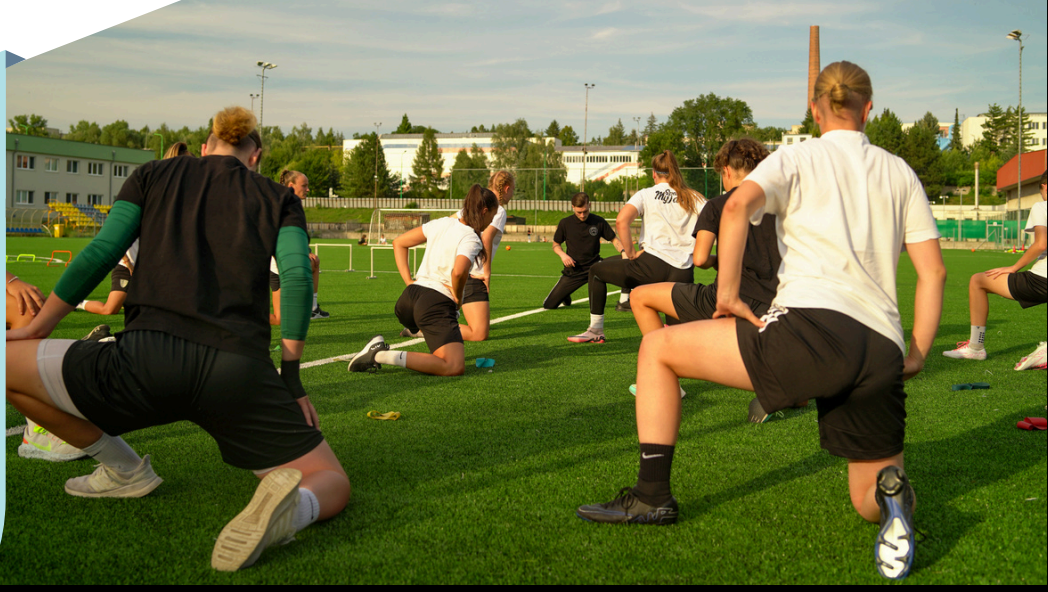
Warm-up is a standard procedure that has been an essential part of every training session for over a century. The primary objective of a warm-up is to prepare athletes for training or competition by enhancing performance (Asmussen & Bøje, 2008; Fradkin, Zazryn & Smoliga, 2010) and reducing the risk of injury (Safran, Garrett, Seaber, Glisson & Ribbeck, 1988).

There are two primary methods of warming up: active warm-up and passive warm-up. Active warm-up involves performing a variety of physical exercises aimed at preparing athletes for the upcoming activity. In contrast, passive warm-up relies on external means to achieve the same goal. Evidence suggests that active warm-up is a more effective method (Thielges & Smith, 2022), while passive warm-up can be useful for maintaining body temperature after an initial increase (Bishop, 2003; Kilduff, West, Brown & Cook, 2012).Traditionally, a classic warm-up consisted of 3-5 minutes of large muscle group activation (such as running, skating, or rowing) to raise body temperature, followed by 5-7 minutes of static stretching, and concluding with 5-7 minutes of sport-specific warm-up (Safran, Garrett, Seaber, Glisson & Ribbeck, 1988). This format remained largely unchanged until the early 2000s when new research indicated that static stretching could decrease strength and power for up to 45 minutes if incorporated into the warm-up (Behm, Button & Butt, 2001; Fowles, Sale & MacDougall, 2000). This finding prompted a revision of traditional warm-up procedures.

At of the 21st century, a new warm-up procedure was introduced, which included a few minutes of jogging, a shift from static stretching to dynamic stretching that enhances flexibility without compromising performance, and then concluding with sport-specific stretching. This approach was the standard for 10 to 15 years (Bompa & Haff, 2009).



M1

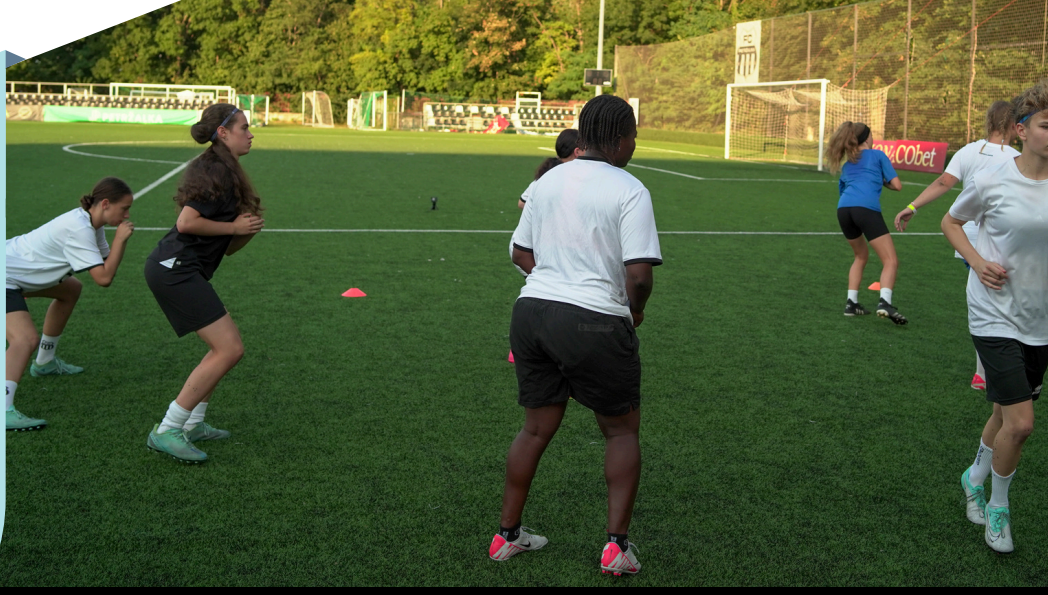


Approximately ten years ago, a similar active protocol emerged, closely resembling Ian Jeffreys' RAMP protocol (Jeffreys, 2007). This protocol consists of foam rolling, active isolated static stretching, glute activation, a dynamic warm-up, movement preparation, and neural activation, followed by a sport-specific warm-up.
Foam rolling, a technique of self-massage for muscle fascia, is typically performed before the warm-up to address deficiencies in specific muscle groups resulting from prior training. Research has demonstrated that foam rolling can increase range of motion (Mohr, Long & Goad, 2014) and elevate muscle temperature without the adverse effects associated with static stretching.

Active isolated static stretching can lead to a decline in power parameters for 30 to 45 minutes following intense static stretching. However, incorporating activation drills after static stretching can negate its effects on power (Behm, Blazevich, Kay & McHugh, 2016). It's crucial to understand the timing of static stretching; performing it before training is preferred because while its effects may be less intense, they can persist for a longer duration.

The gluteus maximus is the primary muscle responsible for generating force during running and jumping, with its main function being hip extension. It can be considered the most critical muscle for athletic activities such as running, jumping, and stabilizing the knee through the iliotibial (IT) band (Mero, Komi, & Gregor, 1992; Parr, Price & Cleather, 2017). The gluteus medius and minimus play vital roles in controlling knee alignment, preventing knee valgus during both static and dynamic movements, provided they are well-developed (Janda, 1983). Based on practical experience, individuals with lower body issues often exhibit "glute amnesia," or inhibition. This condition is attributed to mechanical inhibition (due to lack of use in daily activities) and neural inhibition (where the central nervous system reduces gluteus muscle activation to prevent further injury) (Janda, 1978). Effective **glute activation** can enhance body posture, power, and strength across various movement patterns while decreasing the likelihood of injuries in other muscles, such as the hamstrings (Sugiura, Saito, Sakuraba, Sakuma & Suzuki, 2008). Strengthening the glute muscles can lead to improvements in acceleration, maximum speed, deceleration, and lateral movements (Beardsley & Contreras, 2014).

M1



Movement activation drills–both general and specific–should be performed to warm up in just a few minutes. These drills are designed to rehearse daily movement patterns and enhance the quality of sports-specific movements.
Following these movement activation drills, neural activation exercises should aim for short, explosive bursts of activity to maximize central nervous system activation.

The final step before the main part of the training session is a sport-specific warm-up. For example, football players should practice football-specific movement patterns to prepare for their activities.

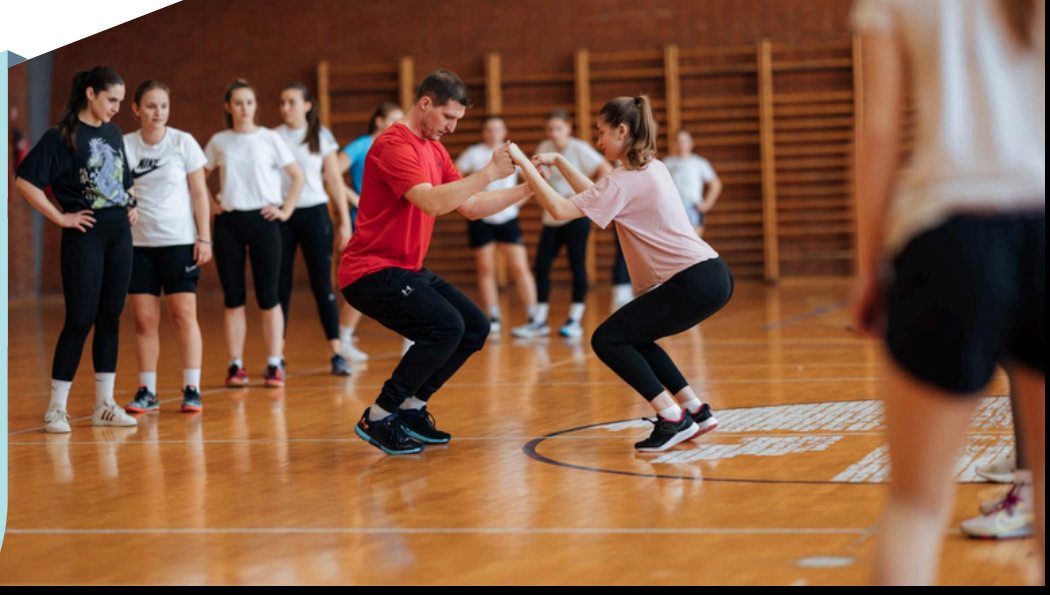
M2

WARM UP FOR INJURY PREVENTION

Female football is experiencing rapid growth, with predictions indicating that by 2026, there could be over 60 million female players (FIFA, 2024). To excel as elite athletes, three key factors come into play: Genetics (“If you want to become an Olympic champion, choose your parents wisely,” noted Dr. Astrand), Diet (including supplementation), and Training (supported by over 25,000 scientific articles that enhance our daily practices). In the past decade, sports training has increasingly focused on injury prevention, emphasizing that a player’s best ability is their availability. When considering the implementation of injury prevention in female football warm-ups, it’s crucial to account for gender-specific characteristics. Women face a significantly higher risk of certain injuries–particularly anterior cruciate ligament (ACL) injuries, which can occur up to eight times more frequently than in men (Agel, Arendt & Bershadsky, 2005; Larruskain et al., 2017).

There are several intrinsic factors–such as hereditary traits–that are beyond our control, including joint instability, ligament structure, hormonal regulation, and knee size. Additionally, anatomical differences (e.g., a larger Q angle due to pelvic structure) and hormonal factors contribute to this increased risk (Mancino et al., 2024; Hewett, Myer & Ford, 2006).On the other hand, extrinsic factors are modifiable and include a player’s fitness level, motor skills, and strength. One important extrinsic factor is the strength ratio between the quadriceps and hamstrings. Many players tend to over-rely on their quadriceps and gastrocnemius muscles while underutilizing their hamstrings, which can lead to delayed activation and insufficient strength in that muscle group (Huston & Wojtys, 1996). Most ACL injuries are non-contact, often occurring during landing or changes of direction (COD) when athletes are in suboptimal body positions. The most common mechanisms of injury involve knee valgus and hyperextension (Boden et al., 2010). Therefore, it is essential for players to learn to avoid these risky positions during play.

M2

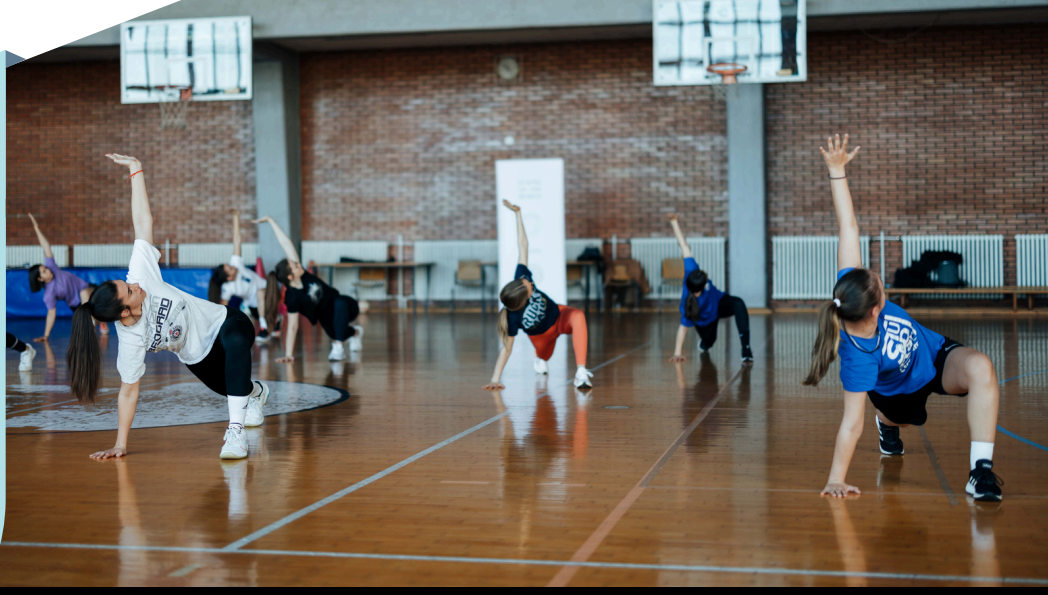


Enhancing strength, particularly in the hamstring muscles (Myer et al., 2009), as well as the muscles surrounding the knee, can significantly lower the risk of injury while also improving performance. Additionally, this can enhance neuromotor control by practicing fundamental movement patterns (Petushek, Sugimoto, Stoolmiller, Smith, & Myer, 2019). A novel approach is to incorporate movement on the court that is guided by external cues (Besier, Lloyd & Ackland, 2003). Injury prevention programs like the American PEP program, FIFA 11+, and Sportsmetrics football training can reduce the risk of ACL injuries by up to 70% when implemented effectively (Attar, 2022; Pollard, Sigward & Powers, 2017; Webster & Hewett, 2018). The field of sport science is evolving rapidly, and it's vital to stay current. Over the past decade, there has been a significant trend towards (p)rehabilitation, aimed at reducing the rising number of injuries that impose considerable financial burdens on sports clubs (Ross et al., 2023; Stojanovic & Ostojic, 2012).

What causes injuries? While there is no straightforward answer, a growing perspective is that injuries stem from compensatory movements or non-optimal movement patterns, resulting in imbalances and pain following injury. A relatively new trend in training emphasizes functional training, which focuses on movement rather than isolated muscle training. Experts Michel Boyle and Gray Cook argue that injuries are likely to occur without proper movement patterns. Movement occurs at joints, and they advocate for a "joint-by-joint" approach, recognizing that our bodies consist of a series of joints, each serving specific functions (either mobility or stability). When a joint fails to perform its function, this can negatively impact adjacent joints and elevate the risk of injury (e.g., limited ankle mobility can lead to increased knee mobility) (Boyle, 2011; Cook, 2011). Developmentally, infants possess remarkable joint mobility (for instance, excellent deep squat capability) but often lose this ability later in life (resulting in diminished hip mobility).

A significant issue among elite athletes is the deficiency in basic movement patterns–such as squatting–often exacerbated by sitting postures (Myer et al., 2014). Prolonged sitting can lead to shortened hip flexors, while also inhibiting gluteus muscle activation, which creates an anterior pelvic tilt. Consequently, decreased hip mobility can increase demands on nearby joints, such as the lumbar and knee joints, potentially raising the risk of injury (Neumann, 2010).

M2



Low hip mobility is directly correlated with diminished athletic performance, resulting in reduced strength, power, and speed outputs (Moreno-Pérez et al., 2022). Fortunately, deficits in hip mobility can be reversed through targeted training. Incorporating specific hip mobility exercises into warm-up routines can be beneficial. Some widely used exercises for enhancing hip mobility include the World's Greatest Stretch and flow movements like Animal Flow, which engage various aspects of hip joint movement. These exercises are low-energy, making them suitable for regular inclusion in training protocols, such as warm-ups or pre-warm-ups.

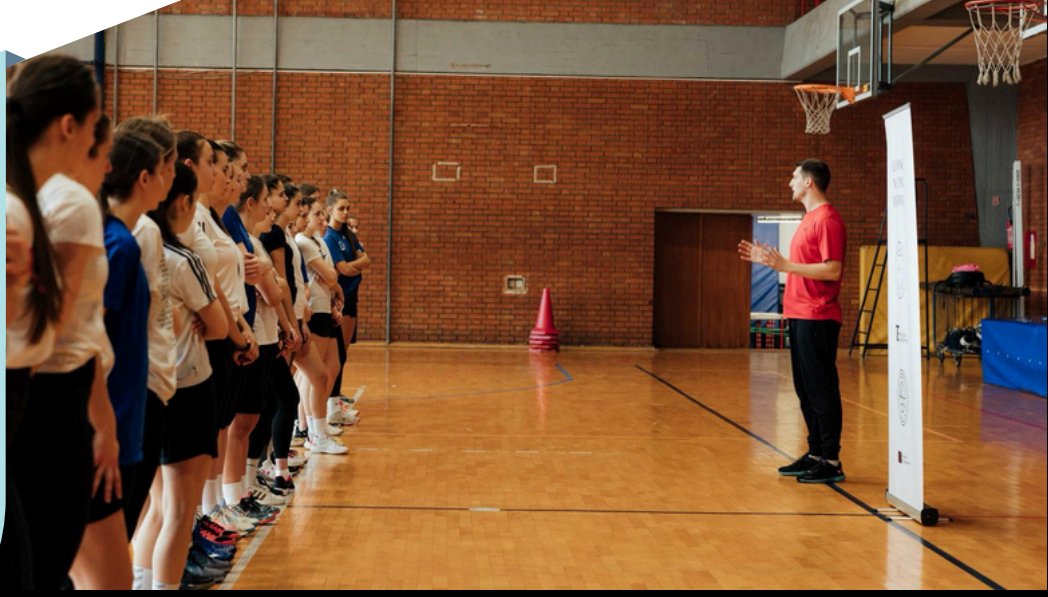
M3

WARM UP - WINDOW OF OPPORTUNITY

Warm-up routines are essential for preparing athletes for both training and competition by elevating body temperature and facilitating metabolic, neural, and psychological adaptations (McGowan, Pyne, Thompson & Rattray, 2015). These routines can vary significantly in their structure, modalities, and intensity (Thapa et al., 2023). The warm-up required before a football match often differs in structure from that performed prior to a training session (Afonso et al., 2024). This paper will specifically focus on the warm-up protocols deployed before training sessions. The time allocated for warm-ups constitutes a significant portion of total training time, especially over the course of a season. This substantial investment of time presents practitioners with an opportunity to incorporate additional goals beyond the standard warm-up protocols. Such adjustments can promote long-term adaptations that enhance overall athletic performance (Jeffreys, 2019).

Moreover, warm-ups need not be monotonous or repetitive. Incorporating enjoyable games, referred to as ludic warm-ups, can not only reduce boredom but also alleviate mental and emotional stress, thereby fostering team cohesion and bonding (Afonso et al., 2021). As previously mentioned, the primary goal of warm-ups is to prepare athletes for the upcoming activities, utilizing physiological phenomena such as Post Activation Potentiation (PAP) or Post Activation Performance Enhancement (PAPE) to boost performance on the football pitch (Fiorilli et al., 2020; Sanchez-Sanchez et al., 2018). However, it is essential to recognize that not all athletes respond positively to the same intensity of stimuli, and the optimal rest periods between these stimuli can vary significantly among individuals.

M3



While a general team warm-up can be standardized, it is beneficial to allow for individualized adjustments. Additional time for individualized work before or after the main warm-up session can be advantageous, as athletes may respond differently to the same warm-up routine (Dingley, Willmott & Fernandes, 2020).In practical scenarios, coaches may encounter athletes who experience pain, discomfort, or both. Strategies such as incorporating isometric training for players suffering from patellar or Achilles tendon pain can be highly effective. This approach can alleviate pain and enable these athletes to participate in football training. The pain neuromatrix theory, as described by the author Moseley (2003), provides insights into alleviating pain and restoring normal functioning. Isometric exercises have become a common component of contemporary warm-up routines. Research indicates that isometric training can significantly reduce tendon pain in the short term; for instance, performing five sets of 45 seconds at 70% of Maximal Voluntary Isometric Contraction (MVIC) has shown substantial reductions in pain perceptions, with effects lasting at least 45 minutes, alongside increases in quadriceps strength.

In this context, isometrics can function similarly to Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) (Rio et al., 2015). Furthermore, isometric exercises have been shown to enhance tendon stiffness (Kubo, Kanehisa & Fukunaga, 2001) and induce structural changes in collagen within the tendon. Training protocols lasting no more than 10 minutes can be practiced multiple times a day, approximately every six hours. Recommended protocols include five sets of five seconds to improve collagen quality and five sets of 30 seconds for less compliant collagen, with high-intensity loads exceeding 80% of one-repetition maximum (1RM) (Baar, 2017). This approach can play a crucial role in effectively managing tendon health and optimizing athletic performance over time.

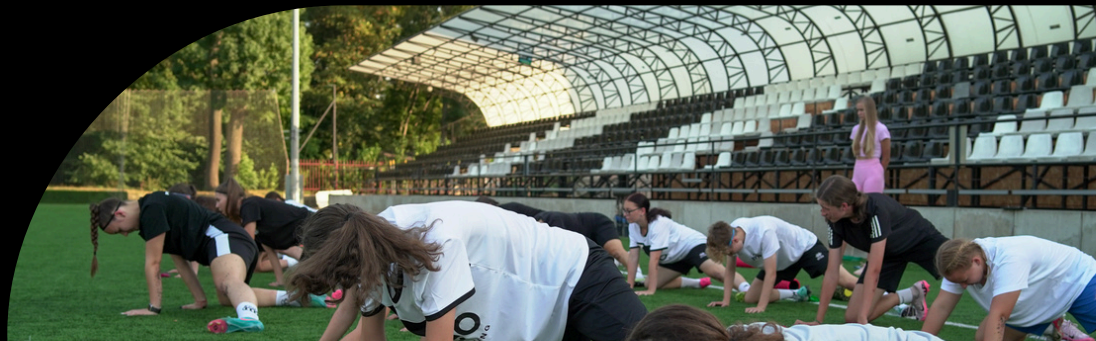
M4

MICRODOSING IN WARM UP

Manipulating training stress effectively during the football season holds substantial importance for enhancing player performance, aiding recovery, and minimizing the risk of injury. Throughout the competitive season, the physical attributes that players worked diligently to develop during the off-season must not only be maintained but, in some instances, even improved (Bompa & Haff, 2009). An excessive training load can lead to decreased performance in subsequent games, a situation that can be mitigated through appropriate load management strategies (Gabbett, 2023).The necessity for microdosing, also referred to as microloading or microtraining, has increased significantly due to the congested schedules prevalent in the competitive season. This concept originated from the idea of reducing the volume of individual training sessions while still maintaining the overall volume of a microcycle and the intensity required to evolve or sustain skills and physical capacities throughout one microcycle (Cuthbert et al., 2021).

Training residuals refer to the retention of beneficial physical changes that occur after ceasing training related to specific physical skills or abilities. These residuals are categorized into long-term, medium-term, and short-term residuals (Issurin, 2008). In team sports such as football, which require various fitness components to be developed simultaneously, a block training approach can lead to enhanced performance outcomes in this type of sport (Issurin, 2016).

One notable characteristic of female football is that the average game load often results in heart rates (HR) around 85% of HRmax, which translates to approximately 161-177 beats per minute. However, during various moments in a match, heart rates can spike to as high as 97% of HRmax (Andersson, Randers, Heiner-Møller & Mohr, 2010; Krustrup, Mohr, Ellingsgaard & Bangsbo, 2005).

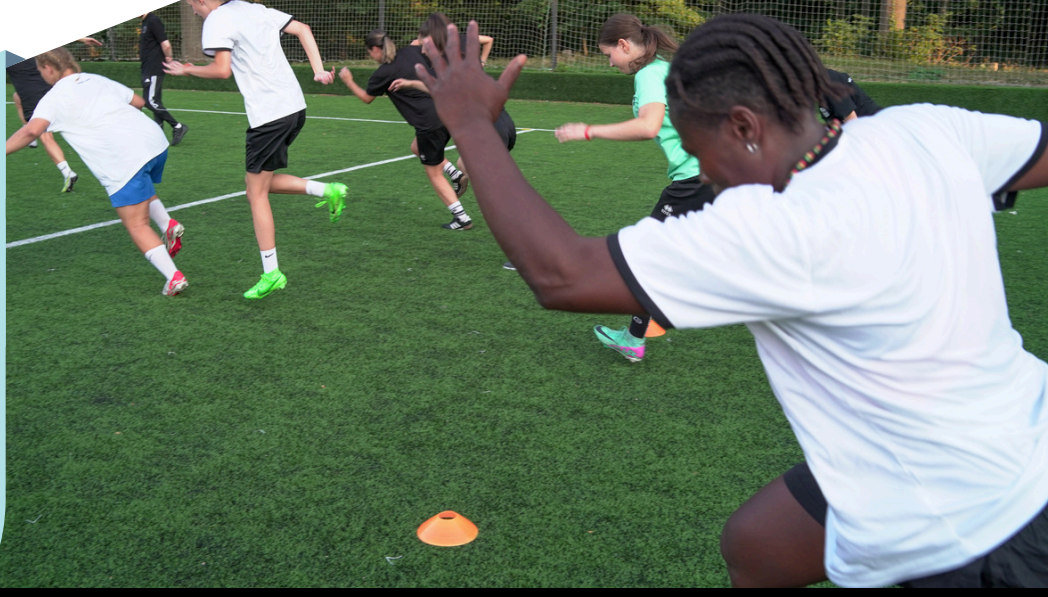


M4

Additionally, lactate concentrations may reach around 5mmol/L, with occasional surges after periods of intense activity (Krustrup, Zebis, Jensen & Mohr, 2010), a statistic that is closely mirrored in male football (Stølen, Chamari, Castagna & Wisløff, 2005). The demands of the game dictate that female football players typically cover distances of approximately 10 kilometers during a match (Gabbett & Malvey, 2008; Hewitt, Norton & Lyons, 2014), with higher-level athletes experiencing greater overall load. Approximately 50% of the total distance covered consists of walking and jogging. Female athletes achieve around 1700 meters during high-intensity bouts (Mohr, Krustrup, Andersson, Kirkendal & Bangsbo, 2008). While this is indeed lower than the distance male football players cover, which ranges from 2000 to 3000 meters, it is still more substantial than what non-elite female athletes manage. Higher-level athletes often engage in more high-intensity running (HIR). When comparing elite female football players to non-elite counterparts, several performance metrics stand out: elite athletes display a higher frequency of high-intensity running (2.4 vs. 1.9), cover greater sprint distances (600 meters vs. 400 meters), and have significantly more total sprints (39 vs. 26). Additionally, their VO2 max values are higher (57 ml/kg/min vs. 49 ml/kg/min) (Datson et al., 2014). Normative data for female football players indicates an average body height between 158 to 170 cm, with body weights ranging from 55 to 65 kg. Their VO2 max typically lies between 47 to 58 ml/kg/min, while vertical jump heights range from 31 to 44 cm. In a 20-meter sprint, times range from 3.0 to 3.31 seconds, and strength levels reach between 1 to 1.5 times body mass in squat performance (Krustrup, Mohr, Ellingsgaard & Bangsbo, 2005).

It's worth noting that the total amount of high-intensity running tends to decrease in the last 15 to 30 minutes of a match compared to any 15-minute stretch prior to the 60th minute of the game. This significant fatigue observed in the final third of the match underscores the critical nature of physical conditioning in female football (Hewitt, Norton & Lyons, 2014).

M4



From the various characteristics discussed regarding the female football game, it becomes evident that specific attributes should be prioritized and integrated into warm-up routines. Strength training is undeniably essential, particularly as it relates to injury prevention, which is even more crucial in female football than in male football. The risk of an ACL injury in female players can be as much as eight times higher compared to their male counterparts. Therefore, key elements of injury prevention include focusing on strength training–especially absolute strength–which can be incorporated into warm-up sessions using microdosing techniques twice a week (Neves et al., 2022; Spiering, Mujika, Sharp & Foulis, 2021), alongside promoting knee stability during landing through correct technique (Kamitani, Hara, Fujii & Yoshida, 2023).

General training recommendations that can be effectively utilized during warm-ups include enhancing motor skills, landing skills, demonstrating how to change direction, and practicing jumping techniques. Notably, the way female athletes land differs, necessitating a focus on low-level plyometrics to help reduce impact forces during landing and directional changes. Furthermore, emphasizing hamstring strength development is a crucial aspect of the training regimen for female football players (Ekstrand, Hallén, Marin & Gauffin, 2023). In terms of other fitness attributes, speed and agility training sessions should be microdosed on Tuesdays and Thursdays–especially when games are scheduled for Saturdays and only one match occurs during the week. Coordination training should be integrated into daily warm-ups to optimize overall athletic performance.

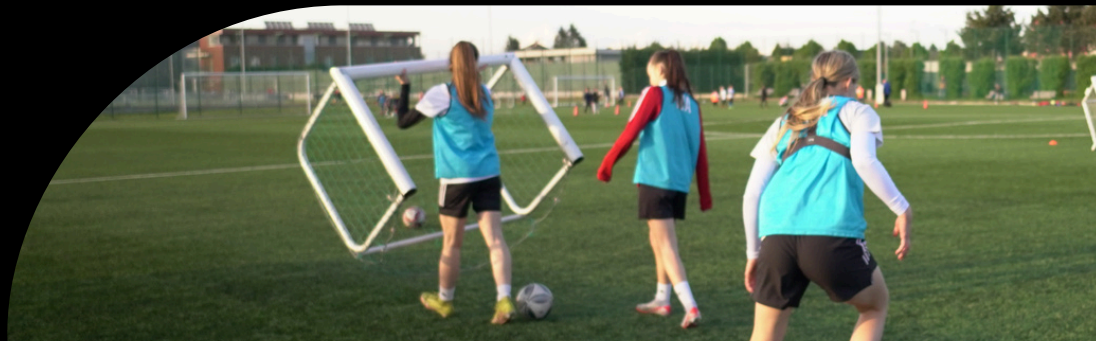
M5

HOW TO PREPARE FOR A FOOTBALL MATCH

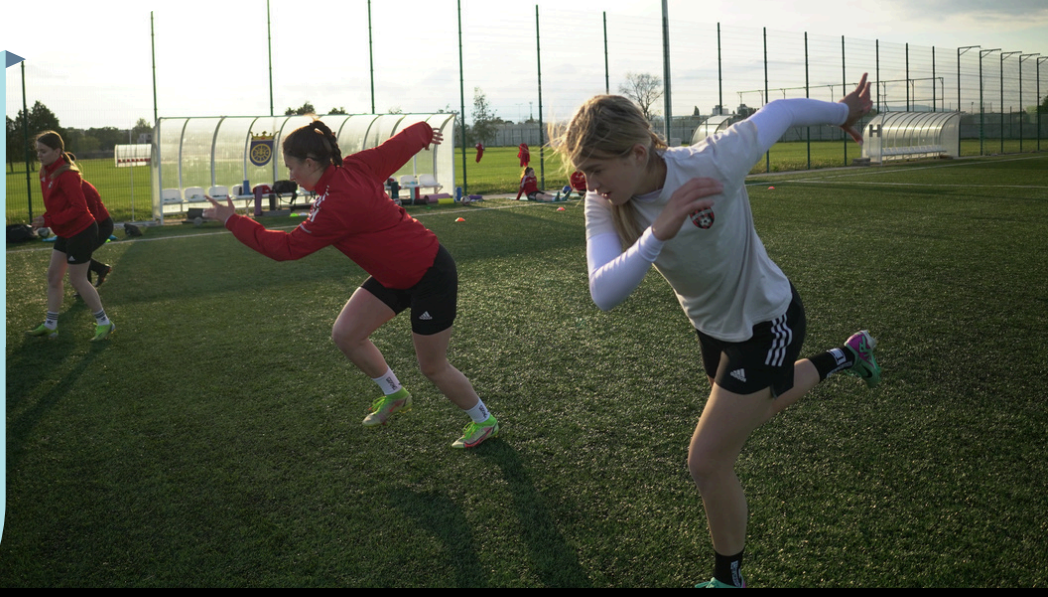
A traditional warm-up before athletic competitions typically lasts about an hour before the match begins. It often includes a combination of stretching (both static and dynamic), various activities with differing intensity levels, and practice of technical and tactical skills. This warm-up generally wraps up around 10 to 15 minutes before the game starts (Towlson, Midgley & Lovell, 2013). Recent studies have shown that not just the duration of warm-ups, but also the order in which activities are performed, can significantly affect players' performance and their perception of effort during the match. For example, one specifically effective warm-up sequence included:

10 minutes of aerobic exercise (to get the heart rate up),
2 minutes focused on speed,
8 minutes dedicated to skills with the ball,
4 minutes of neuromuscular exercises (Brahim et al., 2023).

When looking at the duration of warm-ups, research found that players who warmed up for just **8 minutes** showcased the best performance, particularly in terms of acceleration and lower perceived exertion, compared to those who warmed up for **15** or **25 minutes**. All players began with **5 minutes** of jogging before engaging in the same exercises (Yanci et al., 2019). The primary goal of the warm-up is to enhance performance in the upcoming game. To achieve this, it's recommended to incorporate exercises that improve explosive movements. A short warm-up lasting between **10 to 15 minutes**, which gradually increases in intensity and avoids long breaks afterward, is most effective for maximizing acute performance (Silva et al., 2018).



M5



Additionally, implementing a short training session in the morning before an afternoon match—often referred to as "priming"—can significantly enhance performance. A protocol lasting **15 to 20 minutes**, performed **6 to 9 hours** before the match, could include ground warm-ups, core resistance exercises, lower-body resistance workouts, and reactive agility drills. Studies show that this warm-up routine leads to better outcomes in afternoon football matches compared to not having such a session (Modric et al., 2023). Interestingly, long durations of static stretching have been shown to reduce physical performance markers. In light of this, some experts suggest replacing static stretches with dynamic stretches to improve match performance (Hammami et al., 2018). However, it has also been proven that a brief period of static stretching followed by sport-specific activities does not hinder performance (Stevanovic et al., 2019). Another strategy is to perform a "re-warm-up" during halftime. Players who maintain muscle temperature using heated clothing and engage in 5 minutes of small-sided games or explosive movements perform better than those who rest for 15 minutes. This approach shows that keeping active can preserve muscle readiness and performance (Silva et al., 2018). In one study, players who stayed active during halftime maintained their sprint performance, while those who were passive experienced a drop in performance (Mohr et al., 2004).

In summary, the right warm-up protocol before games plays a crucial role in enhancing athletes' performance by ensuring their bodies are ready for the challenges ahead. Keeping warm, engaging in relevant exercises, and managing intensity properly can make a significant difference in overall game outcomes.

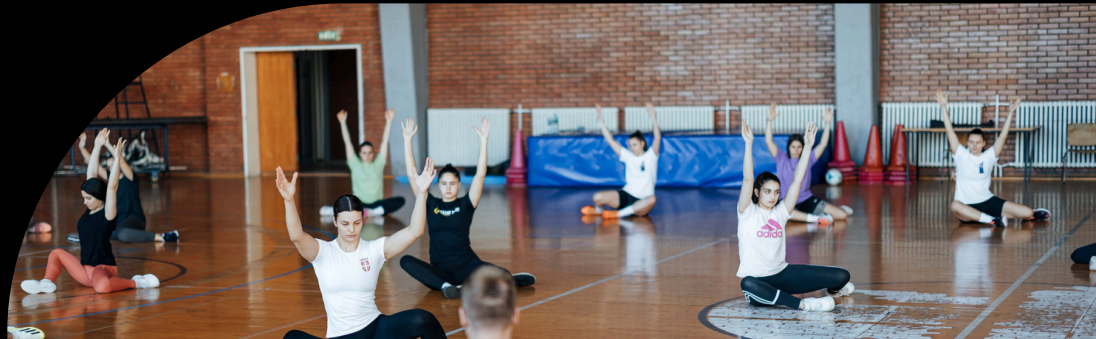
M6

COOL DOWN - HOW?

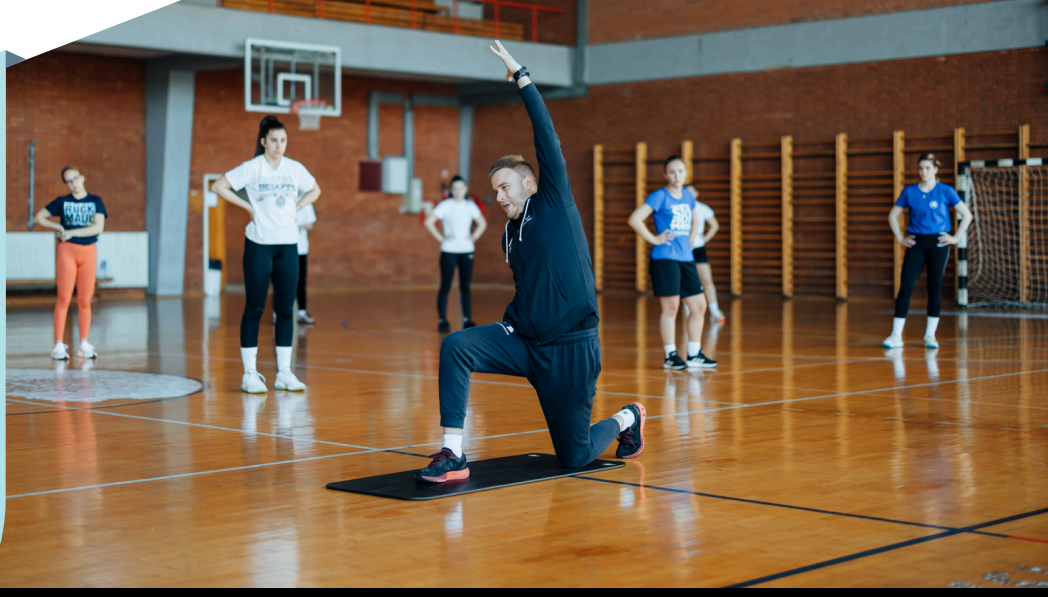
Nowadays we have myriad of very efficient training methods for vast area of fitness attributes: HIIT training (Laursen & Buchheit, 2019), French contrast (Pap effect) (Newton & Kraemer, 1994), RSA (Repeated sprint ability) (Bishop & Spencer, 2004). Consequently, it is getting more and more easier to overload athletes and to get them severely fatigued. It becomes increasingly important to recover athletes (Bishop, Jones & Woods, 2008). “Training that you did is excellent, but how many times per week can you do it?” That is the question that we can ask ourselves.

Recovery depends on physical fitness level of football athletes (it is much easier to overload physically fit athletes, because they tend to recover faster (Abbott & Clifford, 2022). Recovery also depends on mode, intensity and activity that was done before the cool down. Nevertheless, recovery depends on other factors and one of them is cool down strategy. In the last 20 years or so, a lot of research has been conducted in order to reveal efficiency of different recovery strategies on athletes recovery. It is widely assumed that promoting physiological and psychological recovery after exercise allows individuals to perform better during subsequent training sessions or competition, and lowers the risk of injuries.

In order to accelerate the recovery process, cool down is regularly applied at the end of training, mostly lasting from 5 to 15 minutes of low to moderate intensity exercises within one hour from the finishing activity (active cool down). With an increasing number of procedures applied in this final phase of training. Certainly, the most commonly used is active recovery, but lately additional procedures such as static stretching, massage or self-massage and breathing exercises are being carried out more and more often (Van Hooren & Peake, 2018).



M6



Physiological effects of an active cool down better psychophysiological recovery following exercise may attenuate or prevent performance decrements or even enhance performance during a subsequent training session or competition (Cook & Beaven,2013) An active cool-down is believed to have many physiological benefits compared with a passive cool-down (Crowther, Sealey, Crowe, Edwards & Halson ,2017).

General recommendations for cool down involve: 1 dynamic activities performed at a low to moderate intensity to increase blood flow, but prevent development of substantial additional fatigue. 2. Involve low to moderate mechanical impact to prevent the development of muscular damage and delayed- onset muscle soreness; 3. Be shorter than approximately 20 min to prevent substantial interference with glycogen resynthesis 4. In addition, Involve exercise that is preferred by the individual athlete (foam roll, stretching, yoga, breathing drills…) (Van Hooren & Peake, 2018).

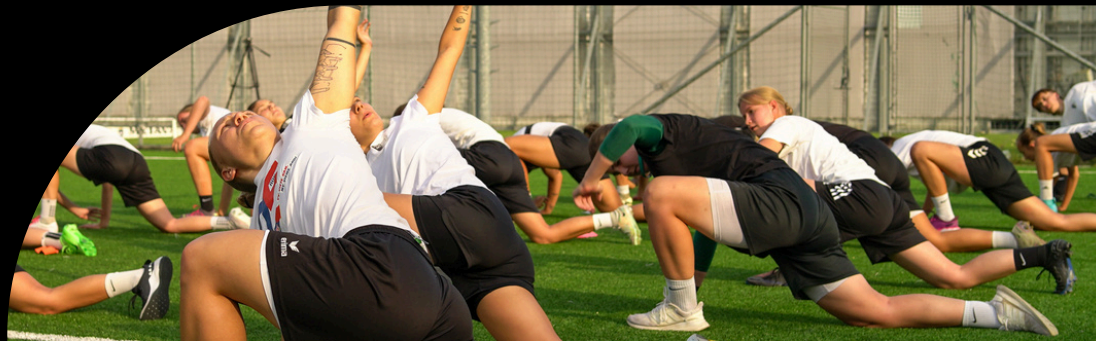
M7

COOL DOWN AFTER A FOOTBALL MATCH

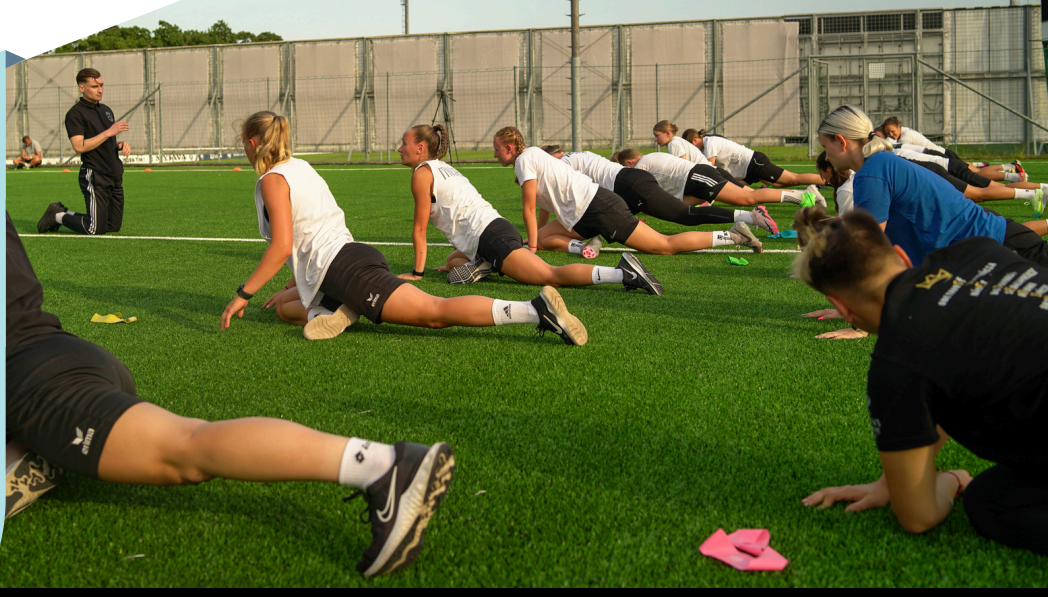
High-intensity exercise like football match, leads to an accumulation of lactate, which has traditionally been associated with fatigue (Cairns et al., 2006). The rate of lactate clearance is indicator of recovery from exercise. Low to moderate intensity active cool down are more effective than a passive cool-down for removing lactate from blood and muscle tissue. However, the functional benefit of faster lactate removal is debatable. Blood lactate returns to resting levels after high intensity exercise within approximately 20 to 120 min even without any post exercise activity (Karlson & Saltin,1971), so faster removal of lactate by an active cool down may therefore be largely irrelevant (Barnett et al.,2006).

Always hot topic in football is injury prevention, so possible long-term effects of an active cool down on injuries and the adaptive response are still considering because of small amount of studies regarding active cool down and injury incidence. Findings for time being are inconclusive. Long term adaptive response preliminary evidence suggests that an active cool down after every training sessions may enhance the long-term adaptive response (Van Hooren & Peake, 2018).

Active cool down is usually combined with other methods of cool down, especially in football practice. Stretching is traditionally used before and after training. After training stretching does not reduce muscle soreness, can reduce muscle stiffness. It appears to contribute to a reduction in post-exercise edema and an improvement in subjective feeling (Barnett et al., 2006). Stretching does not reduce the incidence of injuries in football players (Stojanovic and Ostojic, 2011).



M7



Foam rolling is nowadays regularly incorporated in cool down. In the research of (Rey, Padrón-Cabo, Costa & Barcala-Furelos,2017) their research on group of professional football players observed less muscle soreness, increase range of motion, improved agility but not sprint test. In the foam rolling may facilitate recovery from exercise, but more research is needed (Van Hooren & Peake, 2018).

Research generally does not support the application of the mentioned recovery methods for in terms of improving physiological parameters! However, recent research (Bahnert, Norton & Lock, 2012) indicates that the subjective feeling of top athletes is improved by applying most of these procedures. Players think that they have recovered more and subjectively experience the following training stimuli more easily.

In the narrative review of (Querido, Radaelli, Brito, Vaz & Freitas), this research group divided recovery methods after the football match based on level of evidence, frequency of use and harmful effect. Where level 1 are sleep and nutrition, because they are shown as beneficial and most used. Level 2 consists of cold water immersion that is frequently used in practice, positive effect of this method is recovering perceptive results, but there are numerous studies that showed detrimental effects on muscle protein synthesis and muscle adaptation. Massages and compression garments are level 3 with moderate use and some perceptual benefits have been demonstrated. Active recovery is level 4 with very frequent use in football, but with no strong evidence baking it use. In the last level, level 5 are electro stimulation and stretching that showed limited benefits of post-match recovery with no downside effects with moderate use.

M8

COOL DOWN - NUTRITIONAL ASPECT

Exercise can lead to a significant depletion of glycogen storage, as demonstrated by Burke et al. (2017). To optimize subsequent performance, implementing effective strategies to enhance glycogen resynthesis is crucial. Research has shown that there is no substantial difference in the rate of glycogen resynthesis between active and passive cool-down methods (Bangsbo, 1994; Peters Futre, Noakes, Raine & Terblanche, 1987), and in fact, some studies suggest that active cool-downs may actually lead to a reduction in glycogen resynthesis (Fairchild et al., 2003; Choi, Cole, Goodpaster, Fink & Costill, 1994). It appears that shorter active cool-down periods might have a less detrimental effect on glycogen resynthesis.

Overall, the findings indicate that active cool-downs do not significantly impact the recovery of neuromuscular function or the contractile properties of muscles.The ingestion of carbohydrates plays a critical role in recovery for both male and female athletes, and current guidelines do not differentiate between the sexes when it comes to recommendations for post-activity recovery and glycogen replenishment. A primary challenge faced by athletes is the low intake of carbohydrates, often influenced by aesthetic considerations. Refueling with carbohydrates as soon as possible after exercise increases the likelihood of fully restored glycogen stores in time for subsequent training sessions, which is vital for maintaining optimal performance and reducing the risk of injury. Additionally, low glycogen levels following exercise may contribute to increased feelings of tiredness (Bangsbo, Mohr & Krustrup, 2006).

M8

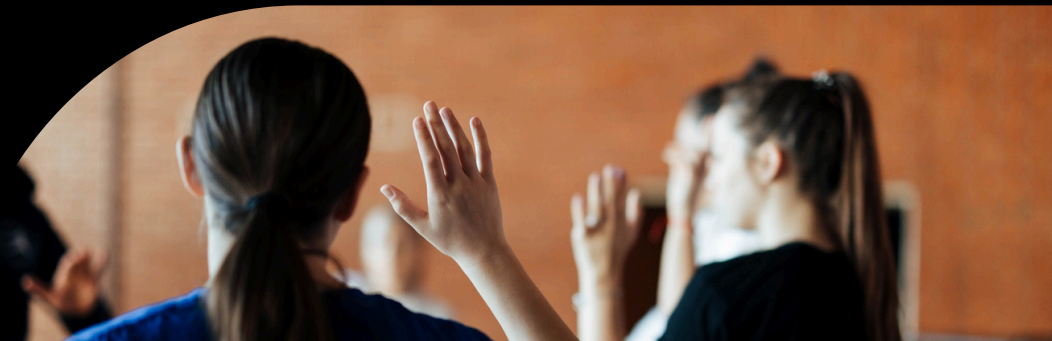
General guidelines for macronutrient intake suggest a distribution of approximately 60% carbohydrates, 20% proteins, and 20% fats. Iron deficiency poses a significant concern, with nearly 60% of female football players experiencing iron deficiency and about 30% presenting with anemia leading up to a World Cup. It is recommended that athletes not only monitor their hemoglobin levels but also their ferritin levels, while emphasizing the consumption of iron-rich foods. Additionally, calcium deficiency is another prevalent issue among this population (Hausswirth & Le Meur, 2011). Many female football athletes start matches and training sessions in a hypohydrated state. This condition can result in decreased performance, especially when coupled with hot environmental conditions, and can also impair cognitive function and recovery (Nuccio, Barnes, Carter & Baker, 2017). To aid in rehydration and facilitate glycogen replenishment, post-exercise drinks containing carbohydrates along with a small amount of sodium should be consumed (Bishop, Jones & Woods, 2008). While alcohol is often viewed as an energy-supplying nutrient, it is typically consumed in small quantities by a large portion of the global population. Foods and beverages that contain alcohol are frequently high in energy but deficient in other essential nutrients. Many football players choose to abstain from alcohol during their training periods; however, they may consume amounts that significantly exceed recommended levels after matches, which can lead to negative health effects and, in some instances, impairments in performance (Maughan, 2006). It is crucial for athletes to be mindful of their alcohol consumption, as it can have far-reaching consequences on their health and performance.

M9

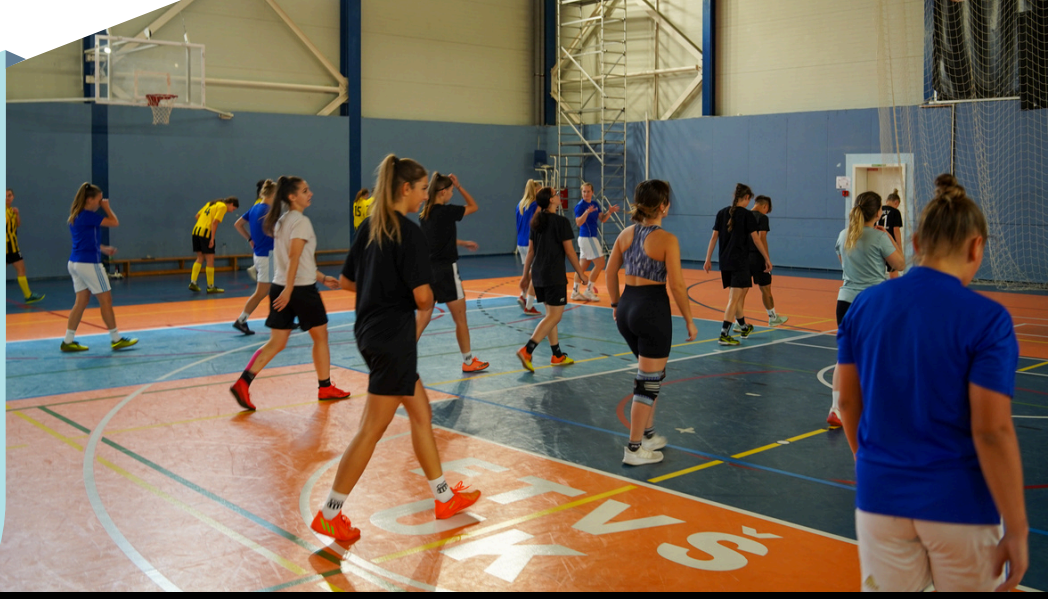
COOL DOWN - CARDIOVASCULAR ASPECT

Football is a physically demanding sport that requires significant stamina, agility, and cardiovascular fitness. As players engage in intense training sessions, especially those that simulate game-like conditions, the heart and lungs work overtime to supply the body with the oxygen it needs to sustain such exertion. However, what happens after the final whistle of practice is equally crucial for athletes: the cool down. Understanding the cardiovascular benefits of proper cool down techniques following football training is essential for player health, performance, and recovery. First and foremost, the cool-down phase helps gradually reduce the heart rate from its elevated state back to resting levels.

During a football training session, players experience a range of heart rates, often reaching near maximum levels due to sprinting, dribbling, and tactical drills. Suddenly stopping intense activity can lead to blood pooling in the extremities and potential dizziness or fainting. By incorporating a structured cool down that involves light jogging or walking, players facilitate a more controlled return to baseline heart function. This gradual decrease in heart rate aids in preventing cardiovascular complications and promotes overall heart health. Additionally, the cool down plays an important role in improving venous return - the process by which blood returns to the heart. Intense exercise causes muscles to contract and exert pressure on veins, helping pump blood back towards the heart. After a rigorous training session, static movements can hinder this process. A cool down maintains muscle engagement through low-intensity activities, enhancing blood flow and preventing the buildup of metabolic waste products, such as lactic acid, which can contribute to muscle soreness and fatigue. This efficient removal of waste products is vital in reducing recovery time and preparing the body for subsequent training sessions or matches.



M9



Moreover, incorporating stretching exercises into the cool-down period can yield significant cardiovascular benefits. Stretching helps improve flexibility, which can prevent injuries that might stem from tight muscles or impaired joint mobility. While the immediate cardiovascular effects of stretching are less pronounced than those of aerobic cool-down activities, the long-term health of muscles and joints positively impacts overall athletic performance. Improved flexibility can contribute to enhanced movement efficiency and reduced injury risk, translating to better cardiovascular health as the body endures fewer disruptions from injuries. Cooling down also provides psychological benefits that can enhance an athlete's motivation and readiness for future training. As players participate in low-intensity activities, it offers a moment for reflection on their performance and practice goals. This mindfulness can lead to better mental preparation for upcoming games or training sessions. A well-structured cool down can reinforce positive habits, not only for cardiovascular recovery but also for maintaining a competitive edge in football.

Recovery from exercise can be seen as a period in which athletes are at higher risk for injuries, or a chance in which the positive adaptations to training can be handled and potentially increased (Luttrell & Halliwill, 2015; Romero, Minson & Halliwill, 2017). Studies showed that ten minutes after exercise heart rate is lower after active cool down versus passive cool down (Takahashi & Miyamoto, 1998), that later on study found the reason for lowering heart rate after cool down and that is faster restoration of vagal and sympathetic tone (Takahashi, Okada, Hayano & Tamura, 2002). Lower breathing frequency and faster oxygen debt recovery was found after active cool down (Gisolfi, Robinson & Turrell, 1966).

An active cool-down has been reported to result in a higher blood flow to the legs and forearm and may prevent post-exercise syncope and cardiovascular complications (Takahashi et al.,1998) Findings suggest that an active cool down may result in a faster recovery of the cardiovascular and respiratory system after exercise (Van Hooren & Peake, 2018).

M9

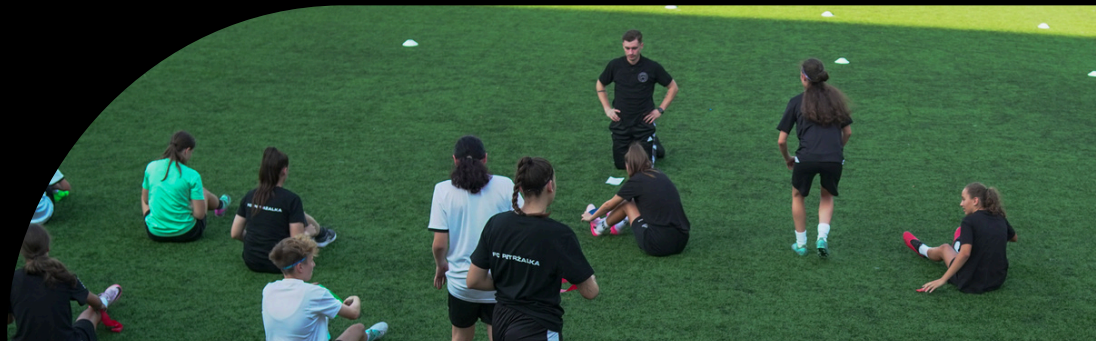
In conclusion, the cool-down period after football training is a fundamental aspect of an athlete's regimen, especially concerning cardiovascular health. It allows for a controlled decrease in heart rate, promotes effective venous return, aids in muscle recovery, enhances flexibility, and supports psychological readiness. For football players striving to maximize their potential, incorporating a proper cool-down routine is not just beneficial; it is essential. Therefore, coaches and athletes alike should prioritize this critical component to ensure optimal performance and long-term health in the beautiful game.

M10

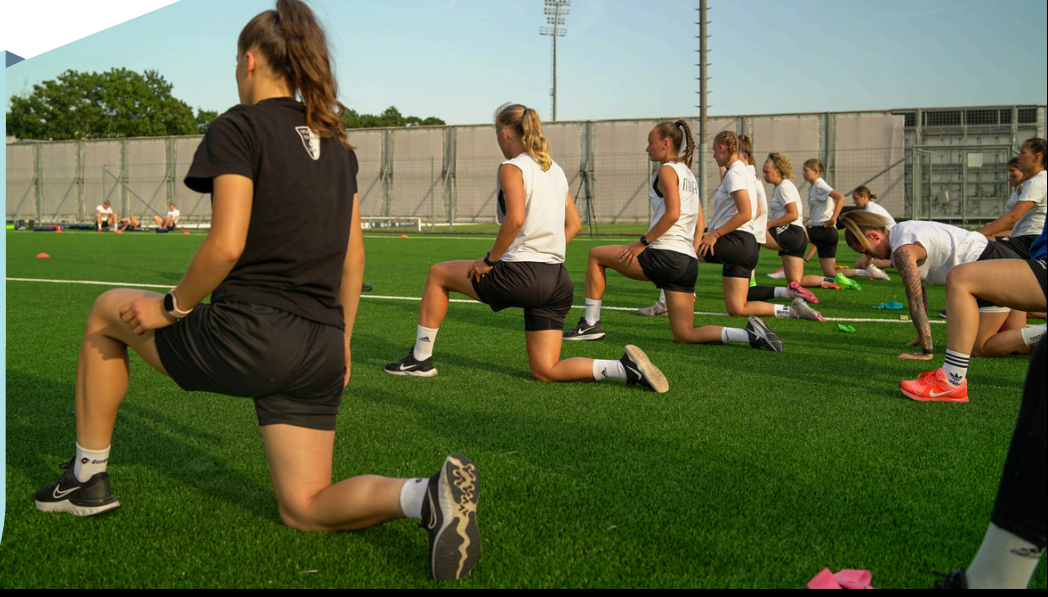
COOL DOWN - MUSCULOSKELETAL ASPECTS

An active cool-down has been shown to enhance blood circulation to muscles and skin, as evidenced by research conducted by Bangsbo, Graham, Johansen, and Saltin (1994). This increased blood flow can potentially reduce the factors associated with muscle soreness, according to Mizimura and Taguchi (2015), and may also facilitate faster muscle repair and recovery, as suggested by Van Hooren and Peake (2018). The physiological rationale behind these benefits lies in the improved delivery of oxygen and nutrients to the muscles, coupled with enhanced removal of metabolic waste products, both of which are critical for optimal recovery.

Despite these theoretical benefits, the practical effectiveness of active cool-downs remains a topic of debate within the sports science community. While some studies have reported positive outcomes, such as reduced muscle soreness following active cool-downs (Tessitore, Meeusen, Cortis, & Capranica, 2007), a considerable body of research involving professional athletes has indicated no significant difference in delayed-onset muscle soreness (DOMS) or tenderness when comparing active cool-downs with passive cool-downs. For instance, Van Hooren and Peake's 2018 review highlighted that, for many athletes, active cool-down techniques are generally ineffective at mitigating DOMS after rigorous physical activities. This inconsistency suggests that while active cool-downs may be beneficial in theory, their practical applications yield mixed results in real-world contexts.



M10



Further complicating the discussion surrounding active cool-downs are findings related to other biomarkers of muscle damage, particularly serum creatine kinase (CK) levels. While active recovery has been proposed to positively influence these markers, the relationship between creatine kinase levels and actual muscle damage remains unclear. Research by Malm et al. (2000) indicates that serum creatine kinase may not serve as a reliable indicator of muscle damage, as it could be more closely related to muscle adaptation processes rather than direct muscle injury. This complicates the interpretation of findings across various studies and calls for further exploration of more accurate biomarkers to assess muscle damage and recovery.

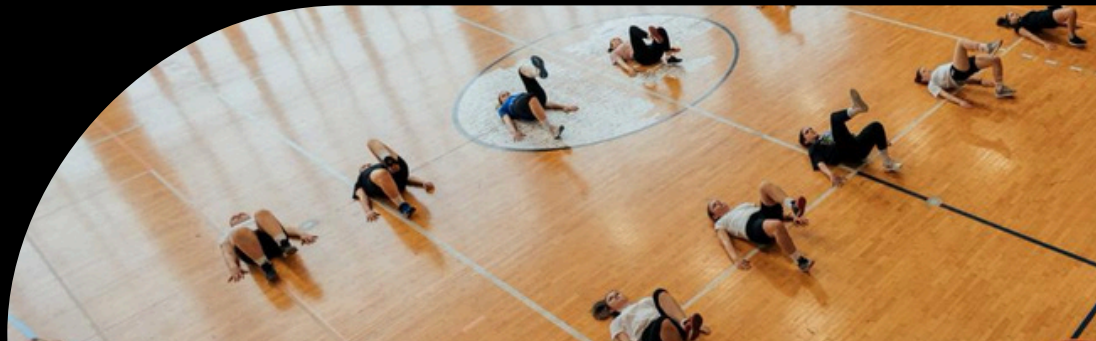
Additionally, the effects of eccentric exercise on musculotendinous stiffness present another challenge in assessing the efficacy of active cool-downs. Eccentric contractions, known for their role in muscle development and performance enhancement, can lead to increased stiffness within the musculotendinous unit following strenuous activity. Research by Dawson, Cow, Modra, Bishop, and Stewart (2005) indicates that active cool-downs do not significantly reduce the stiffness of both muscles and tendons nor do they effectively restore flexibility that may have been diminished during intense exercise sessions. This finding suggests that while active cool-downs may facilitate recovery in terms of blood flow and nutrient delivery, their impact on muscular stiffness and flexibility is limited.

In conclusion, the role of active cool-downs in post-exercise recovery is multifaceted and warrants further investigation. While these practices may theoretically boost blood flow and aid in recovery, the empirical evidence surrounding their effectiveness, particularly regarding muscle soreness and stiffness, remains inconsistent. More research is needed to elucidate the relationships between cooling techniques, muscle damage biomarkers, and overall recovery outcomes. Understanding these complexities will help athletes and trainers make informed choices about their post-exercise routines, optimizing training effectiveness while minimizing the risk of injury.

M11 COOL DOWN AND HEALTH

Exercise has well-documented effects on the body, including both physical and psychological dimensions. Notably, there can be a temporary suppression of the immune system following vigorous physical activity, as highlighted by Peake, Neubauer, Walsh, and Simpson (2017). This post-exercise immunosuppression can leave individuals vulnerable to upper respiratory illnesses and other infections. Therefore, techniques that may aid faster recovery are crucial not only for athletic performance but also for overall health.

Research has investigated the impact of active cool-downs on immune function after exercise. Active cool-downs, as opposed to passive ones, have been shown to substantially mitigate the drop in white blood cell count immediately after exercise. Specifically, studies conducted by Wigernaes, Høstmark, Kierulf, and Strømme (2000) and subsequently by the same team in 2001, found that active cool-down strategies largely preserved circulating immune cells compared to passive recovery methods. However, the significance of these findings seems to diminish over time; Bezerra, Martins, and Silva (2014) found no significant differences in immune cell counts between active and passive cool-down groups 120 minutes after exercise. Similarly, research by Suzuki et al. (2004) indicated that there were no significant differences in immune system markers measured 24 hours after competitive football and rugby matches when comparing the two recovery strategies. This suggests that while active cool-downs may provide some immediate benefits in preventing declines in circulating immune cells, the effects appear negligible beyond a couple of hours post-exercise, aligning with Van Hooren and Peake's (2018) observations.



Beyond immune function, the psychological effects of active cooldowns cannot be overlooked. Psychological factors, such as mood states, self-perception, and sleep quality, are intrinsically linked to physical recovery and performance outcomes. While the majority of studies have not found any significant effect of active cool-downs on psychological recovery measures–such as scores on the Profile of Mood States (POMS) or the Recovery-Stress Questionnaire for Athletes (REST-Q)–participants have often reported that they perceive active cool-downs to be more beneficial than passive cooldowns (Van Hooren & Peake, 2018). This perceived benefit highlights an essential aspect of recovery: belief in the efficacy of a recovery strategy can influence its actual effects on recovery and performance.

While it remains debatable whether the aforementioned questionnaires adequately assess psychological recovery in a meaningful way, it is evident that the perception of recovery modalities plays a significant role in their outcomes. Cook and Beaven (2013) argue that this perception can greatly influence an athlete's response to recovery strategies, suggesting that a positive mindset and belief in the efficacy of active recovery techniques may enhance their benefits.

To summarize, while active cool-downs may have a temporary protective effect on immune cell counts immediately after exercise, their long-term influence appears limited. Psychological benefits, while frequently felt by participants, do not always manifest in measurable improvements. Nonetheless, the subjective perception of active cool-downs as beneficial suggests an area ripe for further exploration. By addressing both physiological and psychological aspects of recovery, individuals may optimize their post-exercise routines, enhancing not only their health but also their overall performance. As research continues to evolve, a deeper understanding of the interplay between these dimensions will be crucial for athletes and coaches alike.

ACKNOWLEDGMENTS

This guidebook is the result of a collaborative effort by a dedicated and skilled team.
We extend our heartfelt gratitude to everyone who contributed their expertise, time, and passion to bring this resource to life.

European Union:

This guidebook was made possible through the generous support of the European Union under the Erasmus+ Sport programme. We express our sincere gratitude for their co-funding and endorsement of this initiative, which underscores the EU's commitment to promoting inclusion, health, and well-being through sports. The support from Erasmus+ Sport has been instrumental in fostering collaboration among our consortium members and ensuring the successful realization of this project.

Consortium members:

- Bratislavia (Slovakia) - For their inclusive approach to sports development and unwavering commitment to equal opportunities.
- Comenius University in Bratislava, Faculty of Management (Slovakia) - For their academic rigor and research-driven insights.
- Trenažna Ekspertiza (Serbia) - For their unparalleled expertise in sports science and their pivotal role in shaping the guidebook's content.

Prof. dr. Marko Stojanović (Trenažna Ekspertiza), for leading the guidebook's development and ensuring its scientific rigor.

We would also like to acknowledge the team of experts and staff, particularly:

- Dr. Tatjana J Stojanović,
- Dr. Vladimir Hrček,
- MSc. Aleksandar Karać,
- MSc. Nikola Andrić,
- MSc. Boris Žigmund

Your dedication has ensured that this guidebook is a valuable and practical resource for athletes and sports enthusiasts alike - Leaving no one behind.

Co-funded by the European Union

TRENAŽNA EKSPERTIZA

BRATISLAVIA MMXX

LET'S CONNECT WITH US

Leaving no one behind

Whether you are a football enthusiast, a coach, or an aspiring athlete, this guidebook is your companion in achieving a balanced, healthy, and fulfilling sporting journey. By implementing the practices and principles outlined here, you can not only improve your performance but also enjoy the many physical, mental, and social benefits of an active lifestyle.

This guidebook represents more than just a collection of best practices - it is a commitment to fostering a sporting environment where preparation and recovery are as valued as competition itself. Together, let us embrace the transformative power of sport and set the foundation for healthier, happier, and more resilient communities.

Let the journey to better health and performance begin!

info@bratislavia.com

www.bratislavia.com

www.tekspertiza.com

www.fm.uniba.sk

Leaving no one behind

TRENAŽNA EKSPERTIZA

REFERENCES

Module 1

- ASMUSSEN, E., & BØJE, O. (2008). Body Temperature and Capacity for Work. Acta Physiologica Scandinavica, 10, 1–22. https://doi.org/10.1111/j.1748-1716.1945.tb00287.x
- Beardsley, C., & Contreras, B. (2014). The Increasing Role of the Hip Extensor Musculature With Heavier Compound Lower-Body Movements and More Explosive Sport Actions. Strength & Conditioning Journal, 36(2), 49–55. https://doi.org/10.1519/SSC.0000000000000047
- Behm, D., Button, D., & Butt, J. (2001). Factors Affecting Force Loss With Prolonged Stretching. Canadian Journal of Applied Physiology = Revue Canadienne de Physiologie Appliquée, 26, 261–272. https://doi.org/10.1139/h01-017
- Behm, D. G., Blazevich, A. J., Kay, A. D., & McHugh, M. (2016). Acute effects of muscle stretching on physical performance, range of motion, and injury incidence in healthy active individuals: A systematic review. Applied Physiology, Nutrition, and Metabolism = Physiologie Appliquee, Nutrition Et Metabolisme, 41(1), 1–11. https://doi.org/10.1139/apnm-2015-0235
- Bishop, D. (2003). Warm up I: Potential mechanisms and the effects of passive warm up on exercise performance. Sports Medicine (Auckland, N.Z.), 33(6), 439–454. https://doi.org/10.2165/00007256-200333060-00005
- Bompa, T. O., & Haff, G. (2009). Periodization: Theory and Methodology of Training. Human Kinetics.
- Fowles, J., Sale, D., & MacDougall, J. (2000). Reduced strength after passive stretch of the human plantarflexors. Journal of Applied Physiology (Bethesda, Md.: 1985), 89, 1179–1188. https://doi.org/10.1152/jappl.2000.89.3.1179
- Fradkin, A. J., Zazryn, T. R., & Smoliga, J. M. (2010). Effects of warming-up on physical performance: A systematic review with meta-analysis. Journal of Strength and Conditioning Research, 24(1), 140–148. https://doi.org/10.1519/JSC.0b013e3181c643a0
- Janda, V. (1978). Muscles, Central Nervous Motor Regulation and Back Problems. In I. M. Korr (Ed.), The Neurobiologic Mechanisms in Manipulative Therapy (pp. 27–41). Springer US. https://doi.org/10.1007/978-1-4684-8902-6_2
- Janda, V. (1983). Muscle Function Testing. https://shop.elsevier.com/books/muscle-function-testing/janda/978-0-407-00201-2
- Jeffreys, I. (2007). Jeffreys I (2007) Warm-up revisited: The ramp method of optimizing warm-ups. Professional Strength and Conditioning. (6) 12-18. Professional Strength and Conditioning, 12–18.

- Kilduff, L., West, D., Brown, N., & Cook, C. (2012). The influence of passive heat maintenance on lower body power output and repeated sprint performance in professional rugby league players. Journal of Science and Medicine in Sport / Sports Medicine Australia, 16. https://doi.org/10.1016/j.jsams.2012.11.889
- Mero, A., Komi, P. V., & Gregor, R. J. (1992). Biomechanics of sprint running. A review. Sports Medicine (Auckland, N.Z.), 13(6), 376–392. https://doi.org/10.2165/00007256-199213060-00002
- Mohr, A. R., Long, B. C., & Goad, C. L. (2014). Effect of foam rolling and static stretching on passive hip-flexion range of motion. Journal of Sport Rehabilitation, 23(4), 296–299. https://doi.org/10.1123/jsr.2013-0025
- Parr, M., Price, P., & Cleather, D. (2017). Effect of a gluteal activation warm-up on explosive exercise performance. BMJ Open Sport & Exercise Medicine, 3, e000245. https://doi.org/10.1136/bmjsem-2017-000245
- Safran, M. R., Garrett, W. E., Seaber, A. V., Glisson, R. R., & Ribbeck, B. M. (1988). The role of warmup in muscular injury prevention. The American Journal of Sports Medicine, 16(2), 123–129. https://doi.org/10.1177/036354658801600206
- Sugiura, Y., Saito, T., Sakuraba, K., Sakuma, K., & Suzuki, E. (2008). Strength deficits identified with concentric action of the hip extensors and eccentric action of the hamstrings predispose to hamstring injury in elite sprinters. The Journal of Orthopaedic and Sports Physical Therapy, 38(8), 457–464. https://doi.org/10.2519/jospt.2008.2575
- Thielges, M., & Smith, C. (2022). Comparison of an Active Warm-Up vs. Passive Warm-Up on Vertical Jump Performance. European Journal of Sport Sciences, 1, 27–32. https://doi.org/10.24018/ejsport.2022.1.6.50

Module 2

- Agel, J., Arendt, E. A., & Bershadsky, B. (2005). Anterior cruciate ligament injury in national collegiate athletic association basketball and soccer: A 13-year review. The American Journal of Sports Medicine, 33(4), 524–530. https://doi.org/10.1177/0363546504269937
- Attar, W. S. A. A. (2022). The FIFA 11+ injury prevention program reduces the incidence of knee injury among soccer players: A systematic review and meta-analysis of randomized controlled trials. Journal of Science and Medicine in Sport, 25, S2–S3. https://doi.org/10.1016/j.jsams.2022.09.113
- Besier, T. F., Lloyd, D. G., & Ackland, T. R. (2003). Muscle activation strategies at the knee during running and cutting maneuvers. Medicine and Science in Sports and Exercise, 35(1), 119–127. https://doi.org/10.1097/00005768-200301000-00019
- Boden, B. P., Sheehan, F. T., Torg, J. S., & Hewett, T. E. (2010). Non-contact ACL Injuries: Mechanisms and Risk Factors. The Journal of the American Academy of Orthopaedic Surgeons, 18(9), 520–527.
- Boyle, M. (2011). Advances in Functional Training. Lotus Publishing.
- Cook, G. (2011). Movement: Functional Movement Systems: Screening, Assessment, Corrective Strategies. On Target Publ.
- FIFA. (2024, July). FIFA-Women-s-Football-Strategy-2018-2027_EN.pdf. https://digitalhub.fifa.com/m/16fe7c8e9a285f15/original/FIFA-Women-s-Football-Strategy-2018-2027_EN.pdf
- Hewett, T. E., Myer, G. D., & Ford, K. R. (2006). Anterior cruciate ligament injuries in female athletes: Part 1, mechanisms and risk factors. The American Journal of Sports Medicine, 34(2), 299–311. https://doi.org/10.1177/0363546505284183
- Huston, L. J., & Wojtys, E. M. (1996). Neuromuscular performance characteristics in elite female athletes. The American Journal of Sports Medicine, 24(4), 427–436. https://doi.org/10.1177/036354659602400405

- Larruskain, J., Lekue, J., Diaz, N., Odriozola, A., & Gil, S. (2017). A comparison of injuries in elite male and female football players: A 5-Season prospective study. Scandinavian Journal of Medicine & Science in Sports, 28. https://doi.org/10.1111/sms.12860
- Mancino, F., Kayani, B., Gabr, A., Fontalis, A., Plastow, R., & Haddad, F. S. (2024). Anterior cruciate ligament injuries in female athletes: Risk factors and strategies for prevention. Bone & Joint Open, 5(2), 94–100. https://doi.org/10.1302/2633-1462.52.BJO-2023-0166
- Moreno-Pérez, V., Rodas, G., Peñaranda-Moraga, M., López-Samanes, Á., Romero-Rodríguez, D., Aagaard, P., & Del Coso, J. (2022). Effects of Football Training and Match-Play on Hamstring Muscle Strength and Passive Hip and Ankle Range of Motion during the Competitive Season. International Journal of Environmental Research and Public Health, 19(5), 2897. https://doi.org/10.3390/ijerph19052897
- Myer, G. D., Ford, K. R., Barber Foss, K. D., Liu, C., Nick, T. G., & Hewett, T. E. (2009). The relationship of hamstrings and quadriceps strength to anterior cruciate ligament injury in female athletes. Clinical Journal of Sport Medicine: Official Journal of the Canadian Academy of Sport Medicine, 19(1), 3–8. https://doi.org/10.1097/JSM.0b013e318190bddb
- Myer, G. D., Kushner, A. M., Brent, J. L., Schoenfeld, B. J., Hugentobler, J., Lloyd, R. S., Vermeil, A., Chu, D. A., Harbin, J., & McGill, S. M. (2014). The back squat: A proposed assessment of functional deficits and technical factors that limit performance. Strength and Conditioning Journal, 36(6), 4–27. https://doi.org/10.1519/SSC.0000000000000103
- Neumann, D. A. (2010). Kinesiology of the hip: A focus on muscular actions. The Journal of Orthopaedic and Sports Physical Therapy, 40(2), 82–94. https://doi.org/10.2519/jospt.2010.3025
- Petushek, E. J., Sugimoto, D., Stoolmiller, M., Smith, G., & Myer, G. D. (2019). Evidence-Based Best-Practice Guidelines for Preventing Anterior Cruciate Ligament Injuries in Young Female Athletes. The American Journal of Sports Medicine, 47(7), 1744–1753. https://doi.org/10.1177/0363546518782460
- Pollard, C. D., Sigward, S. M., & Powers, C. M. (2017). ACL Injury Prevention Training Results in Modification of Hip and Knee Mechanics During a Drop-Landing Task. Orthopaedic Journal of Sports Medicine, 5(9), 2325967117726267. https://doi.org/10.1177/2325967117726267
- Ross, A. G., Agresta, B., McKay, M., Pappas, E., Cheng, T., & Peek, K. (2023). Financial burden of anterior cruciate ligament reconstructions in football (soccer) players: An Australian cost of injury study. Injury Prevention: Journal of the International Society for Child and Adolescent Injury Prevention, 29(6), 474–481. https://doi.org/10.1136/ip-2023-044885
- Stojanovic, M. D., & Ostojic, S. M. (2012). Preventing ACL injuries in team-sport athletes: A systematic review of training interventions. Research in Sports Medicine (Print), 20(3-4), 223–238. https://doi.org/10.1080/15438627.2012.680988
- Webster, K. E., & Hewett, T. E. (2018). Meta-analysis of meta-analyses of anterior cruciate ligament injury reduction training programs. Journal of Orthopaedic Research: Official Publication of the Orthopaedic Research Society, 36(10), 2696–2708. https://doi.org/10.1002/jor.24043

Module 3

- Afonso, J., Brito, J., Abade, E., Rendeiro-Pinho, G., Baptista, I., Figueiredo, P., & Nakamura, F. Y. (2024). Revisiting the 'Whys' and 'Hows' of the Warm-Up: Are We Asking the Right Questions? Sports Medicine (Auckland, N.z.), 54(1), 23–30. https://doi.org/10.1007/s40279-023-01908-y
- Afonso, J., Nakamura, F., Canário-Lemos, R., Peixoto, R., Fernandes, C., Mota, T., Ferreira, M., Silva, R., Teixeira, A., & Clemente, F. (2021). A Novel Approach to Training Monotony and Acute-Chronic Workload Index: A Comparative Study in Soccer. Frontiers in Sports and Active Living, 3, Article 661200. https://doi.org/10.3389/fspor.2021.661200
- Baar, K. (2017). Minimizing Injury and Maximizing Return to Play: Lessons from Engineered Ligaments. Sports Medicine (Auckland, N.z.), 47(Suppl 1), 5–11. https://doi.org/10.1007/s40279-017-0719-x
- Dingley, A. F., Willmott, A. P., & Fernandes, J. F. T. (2020). Self-Selected Versus Standardised Warm-Ups; Physiological Response on 500 m Sprint Kayak Performance. Sports, 8(12), 156. https://doi.org/10.3390/sports8120156
- Fiorilli, G., Quinzi, F., Buonsenso, A., Di Martino, G., Centorbi, M., Giombini, A., Calcagno, G., & di Cagno, A. (2020). Does Warm-up Type Matter? A Comparison between Traditional and Functional Inertial Warm-up in Young Soccer Players. Journal of Functional Morphology and Kinesiology, 5(4), 84. https://doi.org/10.3390/jfmk5040084
- Gołaś, A., Maszczyk, A., Zajac, A., Mikołajec, K., & Stastny, P. (2016). Optimizing post activation potentiation for explosive activities in competitive sports. Journal of Human Kinetics, 52, 95–106. https://doi.org/10.1515/hukin-2015-0197
- Jeffreys, I. (2019). The Warm-Up: Maximize Performance and Improve Long-Term Athletic Development. Human Kinetics.
- Kubo, K., Kanehisa, H., & Fukunaga, T. (2001). Effects of different duration isometric contractions on tendon elasticity in human quadriceps muscles. The Journal of Physiology, 536(Pt 2), 649–655. https://doi.org/10.1111/j.1469-7793.2001.0649c.xd
- McGowan, C. J., Pyne, D. B., Thompson, K. G., & Rattray, B. (2015). Warm-Up Strategies for Sport and Exercise: Mechanisms and Applications. Sports Medicine (Auckland, N.Z.), 45(11), 1523–1546. https://doi.org/10.1007/s40279-015-0376-x
- Moseley, G. L. (2003). A pain neuromatrix approach to patients with chronic pain. Manual Therapy, 8(3), 130–140. https://doi.org/10.1016/s1356-689x(03)00051-1
- Rio, E., Kidgell, D., Purdam, C., Gaida, J., Moseley, G. L., Pearce, A. J., & Cook, J. (2015). Isometric exercise induces analgesia and reduces inhibition in patellar tendinopathy. British Journal of Sports Medicine, 49(19), 1277–1283. https://doi.org/10.1136/bjsports-2014-094386
- Sanchez-Sanchez, J., Rodriguez, A., Petisco, C., Ramirez-Campillo, R., Martínez, C., & Nakamura, F. Y. (2018). Effects of Different Post-Activation Potentiation Warm-Ups on Repeated Sprint Ability in Soccer Players from Different Competitive Levels. Journal of Human Kinetics, 61, 189–197. https://doi.org/10.1515/hukin-2017-0131
- Thapa, R. K., Clemente, F. M., Moran, J., Garcia-Pinillos, F., Scanlan, A. T., & Ramirez-Campillo, R. (2023). Warm-up optimization in amateur male soccer players: A comparison of small-sided games and traditional warm-up routines on physical fitness qualities. Biology of Sport, 40(1), 321–329. https://doi.org/10.5114/biolsport.2023.114286

Module 4

- Andersson, H. A., Randers, M. B., Heiner-Møller, A., Krustrup, P., & Mohr, M. (2010). Elite female soccer players perform more high-intensity running when playing in international games compared with domestic league games. Journal of Strength and Conditioning Research, 24(4), 912–919. https://doi.org/10.1519/JSC.0b013e3181d09f21
- Bompa, T. O., & Haff, G. G. (2009). Periodization: Theory and methodology of training (5th edition). Human Kinetics.
- Cuthbert, M., Haff, G. G., Arent, S. M., Ripley, N., McMahon, J. J., Evans, M., & Comfort, P. (2021). Effects of Variations in Resistance Training Frequency on Strength Development in Well-Trained Populations and Implications for In-Season Athlete Training: A Systematic Review and Meta-analysis. Sports Medicine (Auckland, N.z.), 51(9), 1967. https://doi.org/10.1007/s40279-021-01460-7
- Datson, N., Hulton, A., Andersson, H., Lewis, T., Weston, M., Drust, B., & Gregson, W. (2014). Applied Physiology of Female Soccer: An Update. Sports Medicine, 44(9), 1225–1240. https://doi.org/10.1007/s40279-014-0199-1
- Ekstrand, J., Hallén, A., Marin, V., & Gauffin, H. (2023). Most modifiable risk factors for hamstring muscle injury in women's elite football are extrinsic and associated with the club, the team, and the coaching staff and not the players themselves: The UEFA Women's Elite Club Injury Study. Knee Surgery, Sports Traumatology, Arthroscopy, 31(7), 2550–2555. https://doi.org/10.1007/s00167-023-07429-5
- Gabbett, T. (2023). Load Management: What It Is and What It Is Not! Sports Health, 15, 19417381231179946. https://doi.org/10.1177/19417381231179946
- Gabbett, T., & Mulvey, M. (2008). Time-Motion Analysis of Small-Sided Training Games and Competition in Elite Women Soccer Players. Journal of Strength and Conditioning Research / National Strength & Conditioning Association, 22, 543–552. https://doi.org/10.1519/JSC.0b013e3181635597
- Hewitt, A., Norton, K., & Lyons, K. (2014). Movement profiles of elite women soccer players during international matches and the effect of opposition's team ranking. Journal of Sports Sciences, 32(20), 1874–1880. https://doi.org/10.1080/02640414.2014.898854
- Issurin, V. B. (2016). Benefits and Limitations of Block Periodized Training Approaches to Athletes' Preparation: A Review. Sports Medicine (Auckland, N.Z.), 46(3), 329–338. https://doi.org/10.1007/s40279-015-0425-5
- Kamitani, A., Hara, K., Fujii, Y., & Yoshida, S. (2023). Landing Posture in Elite Female Athletes During a Drop Vertical Jump Before and After a High-Intensity Ergometer Fatigue Protocol: A Study of 20 Japanese Women's Soccer League Players. Orthopaedic Journal of Sports Medicine, 11(6), 23259671231171859. https://doi.org/10.1177/23259671231171859
- Krustrup, P., Mohr, M., Ellingsgaard, H., & Bangsbo, J. (2005). Physical demands during an elite female soccer game: Importance of training status. Medicine and Science in Sports and Exercise, 37(7), 1242–1248. https://doi.org/10.1249/01.mss.0000170062.73981.94
- Krustrup, P., Zebis, M., Jensen, J. M., & Mohr, M. (2010). Game-induced fatigue patterns in elite female soccer. Journal of Strength and Conditioning Research, 24(2), 437–441. https://doi.org/10.1519/JSC.0b013e3181c09b79
- M, M., P, K., H, A., D, K., & J, B. (2008). Match activities of elite women soccer players at different performance levels. Journal of Strength and Conditioning Research, 22(2). https://doi.org/10.1519/JSC.0b013e318165fef6
- Neves, R. P., Vechin, F. C., Teixeira, E. L., da Silva, D. D., Ugrinowitsch, C., Roschel, H., Aihara, A. Y., & Tricoli, V. (2022). Effect of different training frequencies on maximal strength performance and muscle hypertrophy in trained individuals—A within-subject design. PLoS ONE, 17(10), e0276154. https://doi.org/10.1371/journal.pone.0276154

- Spiering, B., Mujika, I., Sharp, M., & Foulis, S. (2021). Maintaining Physical Performance: The Minimal Dose of Exercise Needed to Preserve Endurance and Strength Over Time. Journal of Strength and Conditioning Research, Publish Ahead of Print. https://doi.org/10.1519/JSC.0000000000003964
- Stølen, T., Chamari, K., Castagna, C., & Wisløff, U. (2005). Physiology of soccer: An update. Sports Medicine (Auckland, N.Z.), 35(6), 501–536. https://doi.org/10.2165/00007256-200535060-00004
- Vladimir Issurin (with Internet Archive). (2008). Block Periodization: A Breakthrough in Sports Training. Ultimate Athlete Concepts. http://archive.org/details/blockperiodizati0000vlad

Module 5

- Brahim, M. B., Sal-de-Rellán, A., García-Valverde, A., Yasin, H., & Raya-González, J. (2023). The effect of three different pre-match warm-up structures on male professional soccer players' physical fitness. PeerJ, 11. https://doi.org/10.7717/peerj.15803
- Hammami, A., Zois, J., Slimani, M., Russel, M., & Bouhlel, E. (2018). The efficacy and characteristics of warm-up and re-warm-up practices in soccer players: A systematic review. The Journal of Sports Medicine and Physical Fitness, 58(1–2), 135–149. https://doi.org/10.23736/S0022-4707.16.06806-7
- Modric, T., Carling, C., Peñas, C., Versic, S., Morgans, R., & Sekulic, D. (2023). To train or not to train (on match day)? Influence of a priming session on match performance in competitive elite-level soccer. Journal of Sports Sciences. https://doi.org/10.1080/02640414.2023.2296741
- Mohr, M., Krustrup, P., Nybo, L., Nielsen, J. J., & Bangsbo, J. (2004). Muscle temperature and sprint performance during soccer matches—Beneficial effect of re-warm-up at half-time. Scandinavian Journal of Medicine & Science in Sports, 14(3), 156–162. https://doi.org/10.1111/j.1600-0838.2004.00349.x
- Silva, L. M., Neiva, H. P., Marques, M. C., Izquierdo, M., & Marinho, D. A. (2018). Effects of Warm-Up, Post-Warm-Up, and Re-Warm-Up Strategies on Explosive Efforts in Team Sports: A Systematic Review. Sports Medicine (Auckland, N.Z.), 48(10), 2285–2299. https://doi.org/10.1007/s40279-018-0958-5
- Stevanovic, V. B., Jelic, M. B., Milanovic, S. D., Filipovic, S. R., Mikic, M. J., & Stojanovic, M. D. M. (2019). Sport-Specific Warm-Up Attenuates Static Stretching- Induced Negative Effects on Vertical Jump But Not Neuromuscular Excitability in Basketball Players. Journal of Sports Science & Medicine, 18(2), 282–289.
- Towlson, C., Midgley, A. W., & Lovell, R. (2013). Warm-up strategies of professional soccer players: Practitioners' perspectives. Journal of Sports Sciences, 31(13), 1393–1401. https://doi.org/10.1080/02640414.2013.792946
- Yanci, J., Iturri, J., Castillo, D., Pardeiro, M., & Nakamura, F. Y. (2019). Influence of warm-up duration on perceived exertion and subsequent physical performance of soccer players. Biology of Sport, 36(2), 125–131. https://doi.org/10.5114/biolsport.2019.81114

Module 6

- Abbott, W., & Clifford, T. (2022). The influence of muscle strength and aerobic fitness on functional recovery in professional soccer players. The Journal of Sports Medicine and Physical Fitness, 62(12), 1623–1629. https://doi.org/10.23736/S0022-4707.21.13401-2
- Bishop, D., & Spencer, M. (2004). Determinants of repeated-sprint ability in well-trained team-sport athletes and endurance-trained athletes. The Journal of Sports Medicine and Physical Fitness, 44(1), 1–7.
- Bishop, P. A., Jones, E., & Woods, A. K. (2008). Recovery from training: A brief review: brief review. Journal of Strength and Conditioning Research, 22(3), 1015–1024. https://doi.org/10.1519/JSC.0b013e31816eb518
- Cook, C. J., & Beaven, C. M. (2013). Individual perception of recovery is related to subsequent sprint performance. British Journal of Sports Medicine, 47(11), 705–709. https://doi.org/10.1136/bjsports-2012-091647
- Crowther, F., Sealey, R., Crowe, M., Edwards, A., & Halson, S. (2017). Team sport athletes' perceptions and use of recovery strategies: A mixed-methods survey study. BMC Sports Science, Medicine & Rehabilitation, 9, 6. https://doi.org/10.1186/s13102-017-0071-3
- Laursen, P., & Buchheit, M. (2019). Science and Application of High-Intensity Interval Training: Solutions to the Programming Puzzle. Human Kinetics.
- Newton, R. U., & Kraemer, W. J. (1994). Developing Explosive Muscular Power: Implications for a Mixed Methods Training Strategy. Strength & Conditioning Journal, 16(5), 20.
- Van Hooren, B., & Peake, J. M. (2018). Do We Need a Cool-Down After Exercise? A Narrative Review of the Psychophysiological Effects and the Effects on Performance, Injuries and the Long-Term Adaptive Response. Sports Medicine (Auckland, N.z.), 48(7), 1575–1595. https://doi.org/10.1007/s40279-018-0916-2

Module 7

- Bahnert, A., Norton, K., & Lock, P. (2013). Association between post-game recovery protocols, physical and perceived recovery, and performance in elite Australian Football League players. Journal of Science and Medicine in Sport, 16(2), 151–156. https://doi.org/10.1016/j.jsams.2012.05.008
- Barnett, A. (2006). Using recovery modalities between training sessions in elite athletes: Does it help? Sports Medicine (Auckland, N.Z.), 36(9), 781–796. https://doi.org/10.2165/00007256-200636090-00005
- Cairns, S. P. (2006). Lactic acid and exercise performance: Culprit or friend? Sports Medicine (Auckland, N.Z.), 36(4), 279–291. https://doi.org/10.2165/00007256-200636040-00001
- Karlsson, J., & Saltin, B. (1971). Diet, muscle glycogen, and endurance performance. Journal of Applied Physiology, 31(2), 203–206. https://doi.org/10.1152/jappl.1971.31.2.203
- Querido, S. M., Radaelli, R., Brito, J., Vaz, J. R., & Freitas, S. R. (2024). Practical Guidance to Optimize Postmatch Recovery in Elite Male and Female Soccer: A Review. Strength & Conditioning Journal, 46(4), 415. https://doi.org/10.1519/SSC.0000000000000822
- Rey, E., Padrón-Cabo, A., Costa, P. B., & Barcala-Furelos, R. (2019). Effects of Foam Rolling as a Recovery Tool in Professional Soccer Players. Journal of Strength and Conditioning Research, 33(8), 2194–2201. https://doi.org/10.1519/JSC.0000000000002277
- Stojanovic, M. D., & Ostojic, S. M. (2011). Stretching and injury prevention in football: Current perspectives. Research in Sports Medicine (Print), 19(2), 73–91. https://doi.org/10.1080/15438627.2011.556476
- Van Hooren, B., & Peake, J. M. (2018). Do We Need a Cool-Down After Exercise? A Narrative Review of the Psychophysiological Effects and the Effects on Performance, Injuries and the Long-Term Adaptive Response. Sports Medicine (Auckland, N.z.), 48(7), 1575–1595. https://doi.org/10.1007/s40279-018-0916-2

Module 8

- Bangsbo, J. (1994). Energy demands in competitive soccer. Journal of Sports Sciences, 12 Spec No, S5-12.
- Bangsbo, J., Mohr, M., & Krustrup, P. (2006). Physical and metabolic demands of training and match-play in the elite football player. Journal of Sports Sciences, 24(7), 665–674. https://doi.org/10.1080/02640410500482529
- Bishop, P. A., Jones, E., & Woods, A. K. (2008). Recovery from training: A brief review: brief review. Journal of Strength and Conditioning Research, 22(3), 1015–1024. https://doi.org/10.1519/JSC.0b013e31816eb518
- Burke, L. M., Ross, M. L., Garvican-Lewis, L. A., Welvaert, M., Heikura, I. A., Forbes, S. G., Mirtschin, J. G., Cato, L. E., Strobel, N., Sharma, A. P., & Hawley, J. A. (2017). Low carbohydrate, high fat diet impairs exercise economy and negates the performance benefit from intensified training in elite race walkers. The Journal of Physiology, 595(9), 2785–2807. https://doi.org/10.1113/JP273230
- Choi, D., Cole, K. J., Goodpaster, B. H., Fink, W. J., & Costill, D. L. (1994). Effect of passive and active recovery on the resynthesis of muscle glycogen. Medicine and Science in Sports and Exercise, 26(8), 992–996.
- Fairchild, T. J., Armstrong, A. A., Rao, A., Liu, H., Lawrence, S., & Fournier, P. A. (2003). Glycogen synthesis in muscle fibers during active recovery from intense exercise. Medicine and Science in Sports and Exercise, 35(4), 595–602. https://doi.org/10.1249/01.MSS.0000058436.46584.8E
- Hausswirth, C., & Le Meur, Y. (2011). Physiological and nutritional aspects of post-exercise recovery: Specific recommendations for female athletes. Sports Medicine (Auckland, N.Z.), 41(10), 861–882. https://doi.org/10.2165/11593180-000000000-00000
- Maughan, R. J. (2006). Alcohol and football. Journal of Sports Sciences, 24(7), 741–748. https://doi.org/10.1080/02640410500482933
- Nuccio, R. P., Barnes, K. A., Carter, J. M., & Baker, L. B. (2017). Fluid Balance in Team Sport Athletes and the Effect of Hypohydration on Cognitive, Technical, and Physical Performance. Sports Medicine (Auckland, N.z.), 47(10), 1951–1982. https://doi.org/10.1007/s40279-017-0738-7
- Peters Futre, E. M., Noakes, T. D., Raine, R. I., & Terblanche, S. E. (1987). Muscle glycogen repletion during active postexercise recovery. The American Journal of Physiology, 253(3 Pt 1), E305-311. https://doi.org/10.1152/ajpendo.1987.253.3.E305

Module 9

- Gisolfi, C., Robinson, S., & Turrell, E. S. (1966). Effects of aerobic work performed during recovery from exhausting work. Journal of Applied Physiology, 21(6), 1767–1772. https://doi.org/10.1152/jappl.1966.21.6.1767
- Luttrell, M. J., & Halliwill, J. R. (2015). Recovery from exercise: Vulnerable state, window of opportunity, or crystal ball? Frontiers in Physiology, 6, 204. https://doi.org/10.3389/fphys.2015.00204
- Romero, S. A., Minson, C. T., & Halliwill, J. R. (2017). The cardiovascular system after exercise. Journal of Applied Physiology, 122(4), 925–932. https://doi.org/10.1152/japplphysiol.00802.2016
- Takahashi, T., & Miyamoto, Y. (1998). Influence of light physical activity on cardiac responses during recovery from exercise in humans. European Journal of Applied Physiology and Occupational Physiology, 77(4), 305–311. https://doi.org/10.1007/s004210050338

- Takahashi, T., Okada, A., Hayano, J., & Tamura, T. (2002). Influence of cool-down exercise on autonomic control of heart rate during recovery from dynamic exercise. Frontiers of Medical and Biological Engineering: The International Journal of the Japan Society of Medical Electronics and Biological Engineering, 11(4), 249–259. https://doi.org/10.1163/156855701321138914
- Van Hooren, B., & Peake, J. M. (2018). Do We Need a Cool-Down After Exercise? A Narrative Review of the Psychophysiological Effects and the Effects on Performance, Injuries and the Long-Term Adaptive Response. Sports Medicine (Auckland, N.z.), 48(7), 1575–1595. https://doi.org/10.1007/s40279-018-0916-2

Module 10

- Bangsbo, J., Graham, T., Johansen, L., & Saltin, B. (1994). Muscle lactate metabolism in recovery from intense exhaustive exercise: Impact of light exercise. Journal of Applied Physiology (Bethesda, Md.: 1985), 77(4), 1890–1895. https://doi.org/10.1152/jappl.1994.77.4.1890
- Dawson, B., Cow, S., Modra, S., Bishop, D., & Stewart, G. (2005). Effects of immediate post-game recovery procedures on muscle soreness, power and flexiblity levels over the next 48 hours. Journal of Science and Medicine in Sport, 8(2), 210–221. https://doi.org/10.1016/s1440-2440(05)80012-x
- Malm, C., Nyberg, P., Engström, M., Sjödin, B., Lenkei, R., Ekblom, B., & Lundberg, I. (2000). Immunological changes in human skeletal muscle and blood after eccentric exercise and multiple biopsies. The Journal of Physiology, 529(Pt 1), 243–262. https://doi.org/10.1111/j.1469-7793.2000.00243.x
- Mizumura, K., & Taguchi, T. (2015). Delayed onset muscle soreness: Involvement of neurotrophic factors. The Journal of Physiological Sciences: JPS, 66(1), 43–52. https://doi.org/10.1007/s12576-015-0397-0
- Tessitore, A., Meeusen, R., Cortis, C., & Capranica, L. (2007). Effects of different recovery interventions on anaerobic performances following preseason soccer training. Journal of Strength and Conditioning Research, 21(3), 745–750. https://doi.org/10.1519/R-20386.1
- Van Hooren, B., & Peake, J. M. (2018). Do We Need a Cool-Down After Exercise? A Narrative Review of the Psychophysiological Effects and the Effects on Performance, Injuries and the Long-Term Adaptive Response. Sports Medicine (Auckland, N.z.), 48(7), 1575–1595. https://doi.org/10.1007/s40279-018-0916-2
-

Module 11

- Bezerra, J. de A., Martins, F. S. B., & Silva, R. P. M. (2014). Passive, Active, and Cryotherapy Post-Match Recovery Strategies Induce Similar Immunological Response in Soccer Players. International Journal of Sports Science.
- Cook, C. J., & Beaven, C. M. (2013). Individual perception of recovery is related to subsequent sprint performance. British Journal of Sports Medicine, 47(11), 705–709. https://doi.org/10.1136/bjsports-2012-091647
- Peake, J. M., Neubauer, O., Walsh, N. P., & Simpson, R. J. (2017). Recovery of the immune system after exercise. Journal of Applied Physiology (Bethesda, Md.: 1985), 122(5), 1077–1087. https://doi.org/10.1152/japplphysiol.00622.2016
- Suzuki, M., Umeda, T., Nakaji, S., Shimoyama, T., Mashiko, T., & Sugawara, K. (2004). Effect of incorporating low intensity exercise into the recovery period after a rugby match. British Journal of Sports Medicine, 38(4), 436–440. https://doi.org/10.1136/bjsm.2002.004309

- Tessitore, A., Meeusen, R., Pagano, R., Benvenuti, C., Tiberi, M., & Capranica, L. (2008). Effectiveness of active versus passive recovery strategies after futsal games. Journal of Strength and Conditioning Research, 22(5), 1402–1412. https://doi.org/10.1519/JSC.0b013e31817396ac
- Van Hooren, B., & Peake, J. M. (2018). Do We Need a Cool-Down After Exercise? A Narrative Review of the Psychophysiological Effects and the Effects on Performance, Injuries and the Long-Term Adaptive Response. Sports Medicine (Auckland, N.z.), 48(7), 1575–1595. https://doi.org/10.1007/s40279-018-0916-2
- Wigernaes, I., Høstmark, A. T., Kierulf, P., & Strømme, S. B. (2000). Active recovery reduces the decrease in circulating white blood cells after exercise. International Journal of Sports Medicine, 21(8), 608–612. https://doi.org/10.1055/s-2000-8478
- Wigernaes, I., Høstmark, A. T., Strømme, S. B., Kierulf, P., & Birkeland, K. (2001). Active recovery and post-exercise white blood cell count, free fatty acids, and hormones in endurance athletes. European Journal of Applied Physiology, 84(4), 358–366. https://doi.org/10.1007/s004210000365

Leaving no one behind
Project 101133967 – LNOB
January 2024 - December 2024
Call: ERASMUS-SPORT-2023

Coordinator
Bratislavia (SK)

Partners
Comenius University in Bratislava, Faculty of Management (SK)
Trenazna Ekspertiza (RS)

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Design and layout: @warriordsg - canva.com.
Images: Trenazna Ekspertiza, Bratislavia.

Leaving no one behind